THE ULTIMATE RADIO
FUTABA'S 14MZ p. 88

ALL-OUT ACTION
GIANT AEROBATS p. 78

FLIGHT SIM
HELI MODELS! p. 141

JULY 2005

# MODEL Airplane NEWS

SUMMER PREVIEW

## 50 HOT
PLANES
ENGINES
& GEAR
& MORE

Kangke Monocoupe

## 3D AEROBATICS
WE SHOW YOU HOW

## THROTTLE UP!
CARBURETOR
TUNING TIPS

+5 FLIGHT TESTS » Sig **Kadet EP-42** » E-flite **Tensor 4D** » Kangke **Monocoupe** » VMAR **F4 Phantom** » Kondor **P-38J**

$5.99US $7.99CAN
0 72246 48120 2
MODELAIRPLANENEWS.COM

# CONTENTS

JULY 2005 VOLUME 133 NUMBER 7

## 50 Sig Mfg. Kadet EP-42

**Relax with this take-anywhere electric**

BY MIKE McGEE

## FEATURES



## FLIGHT TESTS



## CONSTRUCTION



## COLUMNS



## DEPARTMENTS



## READER INFORMATION



ON THE COVER: Kangke's Super Kraft Monocoupe 60/90 ARF is reviewed on page 40. (Photos by Pete Hall.) ON THIS PAGE: Sig's Kadet EP is reviewed on page 50.

# WHAT'S HOT

**NO DOUBT ABOUT IT: THIS IS THE SUMMER OF 3D, AND WE DON'T MEAN** retro movies or colored glasses; we're talkin' 3D RC planes that are especially designed for all-out aerobatics. These wild machines come in all shapes and sizes, from giant-scale gassers to sporty .40-size flyers and down to all-foam, profile electrics. And speaking of electrics, these 3D foamies are literally the fastest-growing market segment in RC: at the annual Weak Signals RC Expo in Toledo, OH, earlier this year, I counted nearly 30 of these small planes, with nearly as many motors designed to power them! To see our favorite new 3D aerobats as well as the latest in scale and sport flying, check out our special 11-page "Hot for Summer" feature starting on page 23.

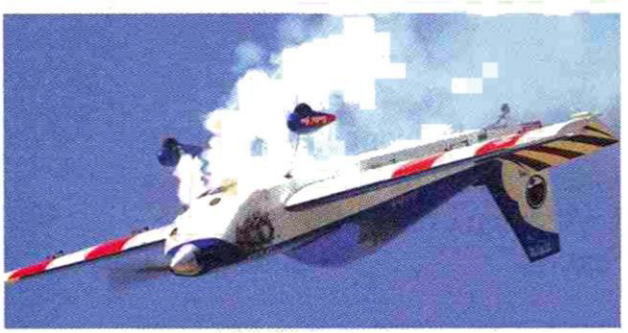
If you've already been bitten by the 3D bug, you'll love Quique Somenzini's flight technique tutorial on harrier rolls and circles. With our detailed illustrations, Quique's advice and a lot of practice, you'll soon be ready to impress your flying buddies. And don't miss our coverage of the first-ever Flying Cirkus in Prado Dam, CA, where top pilots competed for bragging rights in a 3D-only event. Check out John Reid's report on this exciting event in "Outrageous Aerobatics" on page 78.

We're especially excited to introduce a new feature called "Micro RC," in which we'll highlight very small planes, motors and gear. Beginning on page 122, we review a ½-ounce (!) brushless motor and take an up-close look at a tiny, 14-inch-span WACO SRE.

An in-depth examination of Futaba's new 14MZ radio system—a revolutionary radio that's unlike anything we've seen before—begins on page 88. And if you want to get your engine running right, check out our carburetor-tuning tips in Dave Gierke's "Real Performance Measurement" column on page 130.

Your opinion is important to us, and I hope you'll take a moment to fill out and return the reader survey in this issue. This is the perfect opportunity to tell us what topics you'd like to see covered in future issues as well as share your current RC interests. Your responses will help us to create a better magazine and website for you to enjoy.

As we went to press, we were profoundly saddened to hear that our dear friend and longtime contributor Randy Randolph had passed away. Best known for his popular "Small Steps" column, Randy loved both glow and electric "pint-size" planes, and his simple yet elegant models embodied all the personality and charm of their designer. The modeling community has lost a great man; may his enthusiasm for RC and eagerness to teach others continue to inspire us.



Debra Cleghorn

Executive Editor

MODEL Airplane NEWS
Est. 1929

**EDITORIAL DIRECTOR**
Jon Chappell

**EDITORIAL**
EXECUTIVE EDITOR **Debra Cleghorn**
SENIOR TECHNICAL EDITOR **Gerry Yarrish**
ASSOCIATE EDITOR **Rick Bell**
WEST COAST ASSOCIATE EDITOR **John Reid**
MANAGING EDITOR **Molly Z. O'Byrne**
EDITORIAL ASSISTANT **Jill Swiatowicz**

**CONTRIBUTORS**
Peter Abbe, Bob Aberle, Gary Allen, Eric Bean, Tom Carter, Bernard Cawley, Roy L. Clough Jr., Larry Cooper, Budd Davisson, Roy Day, Don Edberg, Dave Garwood, Dave Gierke, Greg Gimlick, Henry Haffke, Sal Iasilli, Matt Keennon, Michael Lachowski, Andy Lennon, George Leu, Vance Mosher, Jim Newman, Dave Patrick, Randy Randolph, Mark Rittinger, Dave Robelen, Martin Robinson, Rodney Roy, Quique Somenzini, John Stewart, Faye Stilley, Michael Stroup, John Tanzer, Jet Thompson, Richard Thompson, Craig Trachten, Pat Tritle, Rich Uravitch, Dick van Mourik, Joe Welsh, Dan Wolanski, Nick Ziroli Sr.

**PUBLISHING**
GROUP PUBLISHERS **Louis V. DeFrancesco Jr., Yvonne M. DeFrancesco**

**COPY**
COPY DIRECTOR **Lynne Sewell**
SENIOR COPYEDITOR **Paige L. Hamilton**
COPYEDITORS **Corey Weber, Suma Kavirajan**

**ART/DESIGN**
CREATIVE DIRECTOR **Betty K. Nero**
SENIOR ART DIRECTOR **Leslie Costa**
ART DIRECTOR **Gayle Van Wely**
MARKETING ART DIRECTOR **Christopher Chu**
ASSOCIATE ART DIRECTORS **Mike Amaditz, Christopher Casey, Victoria Howell, Kevin Monahan**
SENIOR PHOTOGRAPHERS **Pete Hall, Deron Neblett**

**ADVERTISING**
DIRECTOR OF ADVERTISING **Ross Garnick**
ACCOUNT EXECUTIVES **Alex Chung, Rory Gordon, Kathy Gross, Bob Pina**
ADVERTISING TRAFFIC COORDINATOR **Christine DiLauro**

**CONSUMER MARKETING**
CONSUMER MARKETING DIRECTOR **William F. Carter**
FULFILLMENT MANAGER **Stacey Nelson**
MARKETING ASSISTANT **Darlene Murphy**

**CORPORATE MARKETING**
CORPORATE MARKETING DIRECTOR **Jennifer Ware**
SENIOR MARKETING COORDINATOR **Marie Terio**

**PRODUCTION**
DIRECTOR OF PRODUCTION **Laurene R. Booth**
SENIOR PRODUCTION MANAGER **Christine Bachmann**
PRODUCTION MANAGER **Christina Maschke**
SENIOR PRODUCTION COORDINATORS **Sherry Morgan, Bobbi-Jo Baldwick**

**INTERNET**
WEB DEVELOPERS **Leo Ficks, Holly Hansen**
WEB PROGRAMMER **Jaime Torres**

**CORPORATE**
CHAIRMAN OF THE BOARD **Aldo DeFrancesco**
PRESIDENT AND CEO **Louis V. DeFrancesco Jr.**
EXECUTIVE VICE PRESIDENT **Yvonne M. DeFrancesco**
CHIEF FINANCIAL OFFICER **Carol Shepherd**

Member Audit Bureau of Circulations
AirAGE MEDIA
MPA Magazine Publishers of America

100 East Ridge, Ridgefield, CT 06877-4606 USA
www.modelairplanenews.com
PRINTED IN THE USA

## "The best way to solve glitching is to isolate various elements ..."

### RECEIVER GUIDE QUESTION

I have a question about John Reid's article on multichannel receivers in your June 2005 issue. I understand that if I want to add flaps and retractable landing gear to my airplane, I need a 6-channel receiver (4 channels for basic controls plus 2 more) to control them. And I would need a seventh channel if I wanted to add a bomb drop. But what would you possibly need eight to 10 channels for? Isn't that a bit of overkill?

RALPH WATKINS, MURFREESBORO, TN

*Ralph, with the growing popularity of computer radio systems, many transmitters use multichannel mixing to expand model control and functionality. Instead of using a Y-harness to control 2 servos, each servo is plugged into a separate channel and then mixed together. Mixing can be used for adjusting elevator trim when flaps are deployed. So if you have a rather large and complicated model that uses a few mixed functions, eight to 10 channels (or more!) will come in very handy.* GY

### BME CHALLENGER RUDDER

In your May 2005 issue, Pete Abbe's article on the BME Pitts Challenger mentions using 6, 635HB servos on the control surfaces. I see 4 on the ailerons and 2 on the elevator halves. Which type is he using on the rudder? I've got a Flair 80-inch Yak 55, and I plan to use Hitec 5645s on the elevators and ailerons, but I'm not sure which type to put on the rudder. I may have to bite the bullet and buy some more of the 5645s and a programmer so I can gang two of them together. What do you suggest?

SAM SOREM [EMAIL]

*Sam, I used a single 635HB on the rudder of the Pitts; it looks as if I missed that during the proofreading! The 5645s have more than twice the torque of that servo. In my opinion, ganging 2 of these together would be extreme overkill. The Pitts weighed 17 pounds; the Flair Yak is supposed to come in at 12 to 14 pounds. I had ample torque and speed on my rudder with this single 635 servo, and it was set up for maximum possible deflection and aggressive flying. Good luck with the Yak; it sure is a great-looking model!* Pete Abbe

### BUILDING A TIN DONKEY

I am building the Dick Allen Junkers J-10 Tin Donkey that was featured in the January 2000 issue of *Model Airplane News*. My problem concerns the removable front compartment (main fuselage hatch). I cut out the formers (C2 through C6) per the plans, but they are not wide enough to be sheeted with ⅛-inch balsa as shown. If I construct them according to the plans, this compartment would "fall inside" the fuselage because it isn't wide enough. Am I missing something here, or is the former shown on the plan the wrong size?

BRAD MEYER [EMAIL]

*Brad, I don't have a set of the J-10 plans in front of me but I do, however, still have the original J-10, which I fly regularly. I measured the cowl formers' width on mine; C2 is 4¼ inches wide, and the rest of the formers are 6 1/16 inches wide. The cowl sides can be made from either ¼-inch balsa (as I did for mine), or you can laminate two layers of ⅛-inch balsa, which would be easier to bend. The cowl sides should be flush with the fuselage sides. Hope this helps!* **Dick Allen**

### GLITCH BUSTING

I have a problem that I just can't live with anymore. My ¼-scale Ohio RC DHC-1 Chipmunk is powered by a Saito 1.50 4-stroke engine. For 80 percent of the time, I have no problems at all and immensely enjoy the model; it has flaps and lands like a baby carriage. The rest of the time, however, I get random glitch hits on the elevator servos (I run 2 in the tail with a Y-harness). So far, the hits have been exciting but have not caused any close calls. What should I do?

TIMOTHY JOHNSON, SEATTLE, WA

*Timothy, you really ought to stop flying until you solve your glitching problem; not to be in full control of a flying airplane 20 percent of the time is a serious matter! The best way to solve glitching is to systematically isolate various elements in your airborne-radio and airplane-hardware setups. Start by checking all of the moving parts to see whether there is any metal-to-metal contact. The most common is the use of a metal clevis connected to the metal throttle arm on the engine's carburetor; if you are using that type, replace it with a plastic clevis or a ball link.*

*Because the servos are in the tail and are connected to a Y-harness, you have a fair amount of servo lead between the receiver and the elevator servos. This isn't a bad setup, but if you run your antenna wire inside the fuselage for a cleaner appearance, this could be causing the glitching. Route the antenna wire out of the fuselage close to the receiver, and anchor its end at one of the horizontal stabilizer tips. The more distance between the servo leads and the antenna, the better. If that doesn't do the trick, swap out one or both of the elevator servos (as well as the Y-harness), and see whether that solves the problem. Good luck!* **GY**



### FOR THE RECORD

*In the May 2005 issue, the plan for the MiniWave was, in fact, designed by Dave Platt of Dave Platt Models (daveplattmodels.com), though attributed to Rich Uravitch in the article. The MiniWave is based on Platt's larger Heatwave, a turbine-powered sport flyer.* +

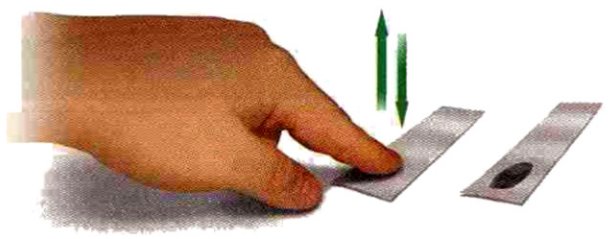
**WRITE TO US!** WE WELCOME YOUR COMMENTS AND SUGGESTIONS. LETTERS SHOULD BE ADDRESSED TO "AIRWAVES," *MODEL AIRPLANE NEWS*, 100 EAST RIDGE, RIDGEFIELD, CT 06877-4606 USA; EMAIL MAN@AIRAGE.COM. LETTERS MAY BE EDITED FOR CLARITY AND BREVITY. WE REGRET THAT, OWING TO THE TREMENDOUS NUMBERS OF LETTERS WE RECEIVE, WE CANNOT RESPOND TO EVERY ONE.

Illustrations by Richard Thompson


## No loose screws

Large, gas-powered models tend to vibrate a lot. Of course, that means that all of the nuts, bolt and screws need to be securely fastened so they don't work loose. One very important screw that is often overlooked is the one that secures the servo arm to the servo. If it vibrates loose and the servo arm falls off, that can ruin your whole day—not to mention your model. After you've fully tightened the screw, fill the center of the servo arm with a drop of silicone or Pacer Zap-a-Dap-a-Goo adhesive. It will keep the screw in place, but the screw will still be easy to remove.

*Edward Turon, West Wyoming, PA*



## Sticky fingers

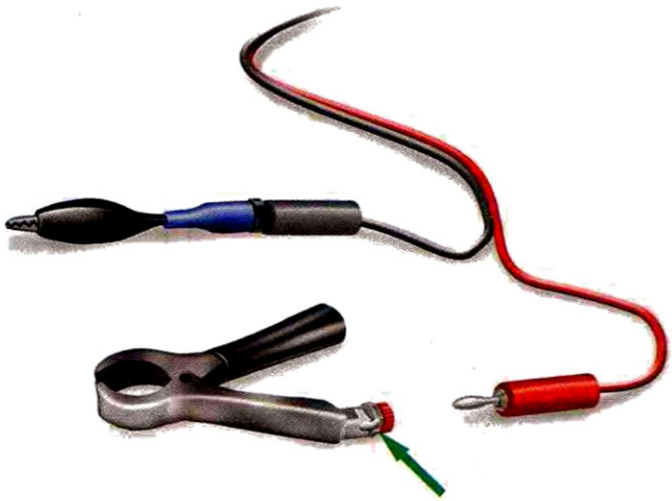
When applying an adhesive-backed decal, many modelers inadvertently leave their fingerprints or flecks of dust and dirt on the decal's adhesive. If the dust or dirt is on the clear portion of the decal, it's there forever for everyone to see. To avoid this, before you peel the decal from its backing sheet, stick a piece of tape on the tips of your fingers and then pull it off. This will remove any loose pieces of skin, dust and dirt from your fingers, and the decal will also adhere better to the model.

*Harry Miller, Shelby, MT*

## Handy alligator clips

If your charger has banana plugs, its use at a flying field can be limited, especially if you use a 12V car battery as a power source. To make the charger more versatile, buy banana-plug receptacles from an electronics-parts store, and solder them to the style of alligator clip that best suits your needs. Now you can plug the banana plugs directly into the alligator clips, and your charger will work in any situation.

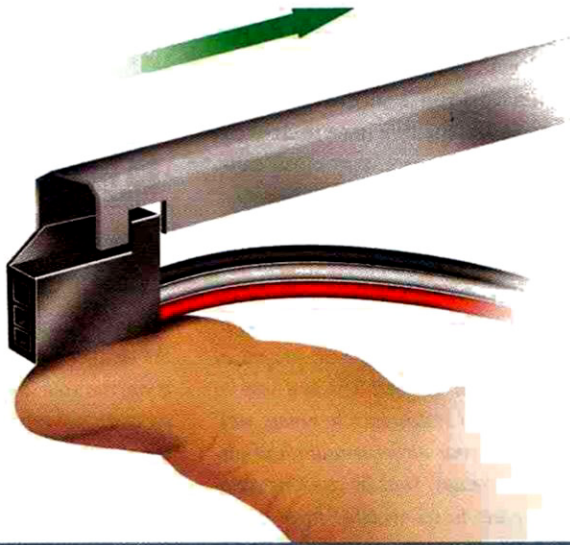
*Karl Byman, Longview, WA*



## Plug safety

Many times, servo plugs can be very difficult to remove from your receiver. If you pull on the wires, you can accidentally pull the connecting pin from the plug, and that isn't good. Here's a simple tool that you can make from an old umbrella frame (those U-shaped metal rods). Cut one of the rods to about 6 inches in length, and grind a slot close to one end of it. This will serve as a groove to snap over the plug. Now you can safely remove the servo plug from your receiver.

*Fabio Nobre Gil, Piracicaba, Brazil*



**SEND IN YOUR IDEAS.** *Model Airplane News* will give a free, one-year subscription (or a one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch and a brief description to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE THAT YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SUBMISSION. Because of the number of ideas we receive, we can neither acknowledge each one nor return unused material.

## Bushwacker
**James Wahner**
Brown Deer, WI

You would never believe that this fun project started out as a 20-year-old wreck! Between the Bushwacker's O.S. .25 FX engine, light 4-pound weight and 68-inch wingspan, it "flies very fast and is an extremely aerobatic plane," explains James. This impressive model can even stay in the air for 15 to 20 minutes with a full 6-ounce tank, but James likes to let it climb to about 100 to 200 feet, then cut the throttle and fly his Bushwacker like a glider. He describes his rejuvenated model as "a very impressive plane on the ground as well as in the air."

## Mach III
**Jordan Bowell**
Burbank, WA

Jordan modified his The World Models Mach II by stripping and recovering it with Pearl Red and Pearl White UltraCote. He also built a turtle deck, scratch-built the aluminum gear and created a better-fitting canopy. With all of these changes, Jordan decided to rename his model the Mach III. He powers his craft with an O.S. .46 LA engine and Futaba radio gear. Jordan tells us that he is currently working on a Mach IV, for which he intends to build flaps, retracts and a cowled engine. Good luck, Jordan!

## Sig 110 Rascal
**Ted W. Cheever**
Prescott, AZ

This project flew to us all the way from Arizona. Ted's Rascal soars with a 110-inch wingspan, a Saito 1.82 twin engine, an 18x6 APC prop, a Futaba radio and 6 Hitec servos. It also uses ¼-scale Sig floats for water-based takeoffs and landings. He calls his model "a perfect floatplane." Ted also explains that he attached the water rudder to the tailwheel assembly, which puts the steering down the center of the fuselage. According to Ted, this gives the model great control, even in windy conditions. Great work!

## Funtana 40 "Bitana"
**Bill Burrow**
Flower Mound, TX

With "flight characteristics that are typical of a biplane," this modified Funtana 40 also has "good stunt capabilities," according to Bill. Named Bitana, Bill's model is powered by a Saito .91 4-stroke engine and JR 8103 radio gear. Adding a second wing, Cessna wheel struts and wheel pants made the model heavier (7 pounds total). The only original elements in Bill's Britana are the control surfaces.

**SEND IN YOUR SNAPSHOTS.** *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable, but please do not send digital printouts or Polaroid prints. Emailed submissions must be at least 300dpi. We receive so many photographs that we are unable to return them. All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in! Send those pictures to "Pilot Projects," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.


LATEST PLANES ENGINES GEAR AND MORE!
BY THE MODEL AIRPLANE NEWS CREW
HOT
FOR
SUMMER

HOT FOR SUMMER


## ELECTRIFLY
## POLYCHARGE 4

Need to charge multiple Li-poly packs simultaneously at the field, but you don't want to lug around several chargers? This dedicated Li-poly charger is four chargers in one, and it's easy to use. Just attach it to a 12V power source, plug in your 1- to 4-cell battery and dial in the battery capacity! Each charging station's output is adjustable from 300 to 3000mAh and features pushbutton start/stop control and a 3-hour safety timer. Added safety features include sounds and tricolor LEDs that warn of improper input voltage and output reverse polarity. The PolyCharge 4 costs $101.

CROWD PLEASER

## SPORTSMAN AVIATION
## RYAN STA

Do you want a timeless classic but don't have time to build the beauty that you've always wanted? The Ryan STA is known for its excellent flight characteristics and timeless good looks. This beauty features all-wood construction, a fiberglass cowl, easy-to-install wheel pants, wing struts and flying wires. The wing spans 57 inches with a generous 488 square inches of area for a wing loading of around 17 ounces per square foot. The Ryan requires a 4-channel radio and a .28 to .46 2-stroke or a .52 4-stroke engine. We know that you'll be proud to add this one to your squadron!

TECH BREAK THROUGH

## HOBBY LOBBY INTL.
## VARIABLE-PITCH PROP

Here's the latest gadget for 3D pilots who want something extra—a propeller that allows you to reverse its pitch during flight. That's right: you can actually fly your Shock Flyer backwards! This revolutionary system uses a specially modified Axi 2208/34 outrunner motor so that the rod that controls the prop's pitch slides through the motor output shaft. The system basically works like a helicopter tail rotor, but it's mounted on the motor output shaft. A separate servo is used to control the prop's pitch. The prop system and motor are sold separately.

## MAXX PRODUCTS INTL.
## HIMAX OUTRUNNER BRUSHLESS MOTORS

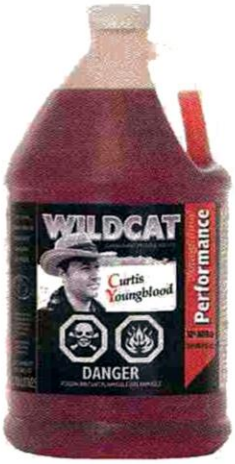
These motors may be small, but they're big in torque and power. Available in several power ranges, they're ideal replacements for standard Speed 280, 370, 400 and 500 to 600-size motors. Each features dual ball bearings and three mounting options (stick mount, nose mount and firewall mount); each includes a prop adapter and two mounting brackets.



CROWD PLEASER

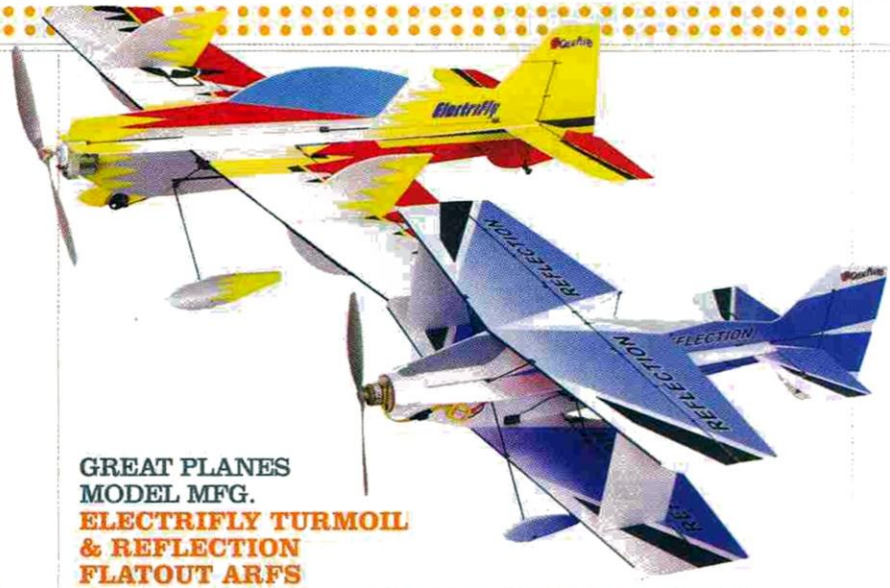
## GREAT PLANES MODEL MFG.
## HELLCAT EP

This famous fighter can be flown almost anywhere! The Grumman Hellcat has been a favorite of RC modelers for years, and it's now available as an easygoing, ARF replica that is small and quiet enough to fly at the local park or schoolyard! Made of smooth, light foam, the Hellcat has molded-in surface details, it comes painted, and decals are included for an authentic WW II look. The Hellcat requires a 3- to 4-channel radio with 2 microservos and a 4-channel receiver, a 10A ESC and an 8-cell battery pack.




## WILDCAT FUELS
## YOUNGBLOOD PERFORMANCE 30

Here's some great news for 3D fliers! Champion pilot Curtis Youngblood has teamed up with Wildcat Fuels and Synthetic Lubricants by Klotz to produce a new fuel combination that gives plenty of punch for high-revving 3D maneuvers but is still easy for beginners to tune. Youngblood Performance 30 is 30-percent nitro and 23-percent synthetic oil; this superior oil is designed to smoke less in full powered flight but still properly lubricate and protect the engine. Because this fuel was designed by Curtis Youngblood, you can expect it to take heli performance to the next level.




## GREAT PLANES MODEL MFG.
## ELECTRIFLY TURMOIL & REFLECTION FLATOUT ARFS

These "flat foamy" airplanes are "flat-out" cool! The FlatOuts are priced right, they require littleassembly and few accessories, and best of all, they bounce back after crashing. Their innovative hardware replaces thetape and glue used in other foam flyers, and a powerful T-370 brushed motor, a 5:1 gearbox and an APC 10x3.8 Slow Flyer prop are included. Specs—FlatOut Turmoil: wingspan, 34 in.; wing area, 291 sq. in.; weight, 8 to 9.5 oz.; wing loading, 4 to 5 oz./sq. ft.; length, 34 in.; $39.99. FlatOut Reflection: wingspan, 27.5 in.; wing area, 400 sq. in.; weight, 9.5 to 11 oz.; wing loading, 4 oz./sq. ft.; length, 31 in.; $44.99.

## KONDOR MODEL PRODUCTS
## TORNADO CP 400

Designed to meet the needs of demanding helicopter pilots, the Tornado CP 400 is the ultimate micro helicopter. It has an ultra-rigid chassis with many refinements. All the critical parts, such as the main rotor head and swashplate, are made of CNC-machined aluminum for optimum reliability and precise control. The Tornado comes with a powerful 380 motor that's geared 13.2:1, and the sharp-looking canopy is completely finished. The main rotor diameter is 23 inches, and the heli weighs in at 16.5 ounces ready to fly. A 5-channel heli radio, a gyro, a 20A ESC (without brake) and a 3-cell, 1500mAh Li-poly battery are required.


## COX
## FOAM FIGHTERS

Micro RC models are like potato chips: you can't have just one! With Cox's line of inexpensive mini-foam fighters, there's no need to stop at only one. Priced at under 20 bucks, these mini-warriors are sure to generate a lot of grins at the field. Each model spans around 20 inches and comes with a 130-size electric motor, two props, a scale spinner, decals and linkages. It's designed for a 3-channel radio; just add two microservos, a micro-receiver, a 5A ESC and a battery. These models not only look good, but they also deliver performance. Anyone up for mini-combat?

## MORRIS HOBBIES
## MARK ENGINES

Our hard-working friends at Morris Hobbies are always coming up with great products for performance-minded RC modelers. Their newest addition is the Mark line of engines. Beautifully manufactured in Hungary, this line of 2-stroke masterpieces includes a 2.10ci, 5.1hp glow engine, a 1.80ci, 4.1hp gasoline engine, a 1.80ci, 4.4hp glow engine and a 3.9hp, 1.35ci glow engine. Morris Hobbies' new 1.55ci, 4-stroke glow engine featuring a rear-mounted valve-train setup is now available. If you've been waiting for serious horsepower, your wait is over!

CROWD PLEASER


## GREAT PLANES MODEL MFG.
### PT-17

Covered in MonoKote, the PT-17 features high-quality balsa, ply and fiberglass construction. It will perform loops, rolls, spins, stall turns, inverted flight and other crowd-pleasing scale aerobatics. Details such as rivet decals and an easy-to-install replica radial engine add realism. Specs: top wingspan, 71.5 in.; bottom wingspan, 69 in.; wing area, 1,466 sq. in.; weight, 14 to 15 lb.; wing loading, 22 to 23.5 oz./sq. ft.; length, 57 in.; engine req'd, .91 to 1.20ci 2- or 4-stroke; radio req'd, 4-channel with 5 servos; $379.99.


## NORTHEAST SAILPLANE PRODUCTS
### VIKING ARF

This high-wing sports trainer incorporates a unique two-piece wing that's fastened into place using a "keyhole" front-locking/hold-down mechanism. It allows the wing to be removed easily but is a strong, slop-free attachment method. The 32- to 40-ounce Viking comes with light fiberglass wheel pants, and its accessible battery tray allows battery swapping without wing removal. Specs: wingspan, 55 in.; length, 40 in.

## CARL GOLDBERG PRODUCTS
### EXTRA 330 1.20 ARF

This giant aerobat boasts the scale looks and performance of the famous airshow thrill-seeker! The cowl and wheel pants are made of fiberglass, and high-quality iron-on covering has already been applied. Its oversize rudder and elevator control surfaces deliver the kind of throws that hot-doggers crave for extreme 3D maneuvers! Specs: wingspan, 77 in.; wing area, 1,118 sq. in.; flying weight, 13 to 14 lb.; length, 67.5 in.; engine req'd, 1.20 to 2.2 2-stroke or 1.20 to 1.80 4-stroke; radio req'd, 4-channel with 8 servos; $419.99.

## HOBBY LOBBY INTL.
### AXI 5330/24 OUTRUNNER MOTOR & JETI ADVANCE 90 PLUS ESC

This monster motor has very high torque and can spin large props in aerobatic models that weigh 20 to 22 pounds. The motor weighs 22.99 ounces, it's 2 7/16 inches in diameter and a compact 2½ inches from back to front. The Jeti Advance 90 Plus ESC handles 14 to 32 Ni-Cd/NiMH cells or 5 to 10 Li-poly cells. It's superb with outrunner motors; it has automatic motor cutoff and automatically detects the number and the type of battery cells being used. The Jeti 90 can easily be programmed to operate a brushless motor or an outrunner motor.


TECH BREAK THROUGH

## HORIZON HOBBY
### SPEKTRUM DSM TECHNOLOGY

We've uncovered something so unique that it may change RC forever! We've heard that this new technology—now used in RC car-radio systems—may soon be available for our airplanes. The Spektrum DSM transmitter module and receiver use "Direct Sequencing Spread Spectrum" (DSSS) modulation that hunts for and locks onto a channel that isn't being used. The system spreads the RC signal data over a wide bandwidth using a random noise code. The receiver will listen only to its transmitter. Stay tuned for more information!


## GREAT PLANES MODEL MFG.
### COMBAT CORSAIR & MUSTANG ARFS

RC combat competition requires a special breed of pilot and a special type of aircraft such as these easy-to-assemble, very affordable ARFs that are legal for AMA 750 Combat Class events. Experienced sport pilots will also want to keep these compact models in the car for spontaneous local sorties. At $99.99, each fighter features built balsa-and-ply structures and factory-applied iron-on film covering. Premium hardware, a fiberglass cowl, a clear canopy and decals are also part of the package. With a flight-ready weight of about 2.5 pounds, these combat ARFs are well below the AMA's 3-pound limit.

## NICK ZIROLI PLANS
### SEIDEL RADIAL ENGINES

OVER THE TOP

If you are a radial-engine lover, you already know that the impressive line of German-made Seidel radial engines has not been available in the U.S. for quite some time. Well, that's all in the past! Nick Ziroli Plans now distributes the Seidel engine line, including the ST525 5-cylinder (7.62ci), the ST770 7-cylinder (4.17ci) and the ST726 7-cylinder (10.98ci) engines. Also in the line is the gigantic ST1450—a twin-row, 14-cylinder, 30.51ci monster!

BACKYARD FAVORITE

## THUNDER TIGER
### CHRISTEN EAGLE BIPLANE

One of Thunder Tiger's 3D Profile EP series, this new biplane features laser-cut parts, basic hardware, a pre-painted scheme and installed carbon-graphite reinforcement strips. It comes with a 6:1 gear-reduction 370 motor and an 11x8 prop and has a span of 30.7 inches. It weighs only 10.5 ounces and has about 370 square inches of wing area. The model requires a 4-channel radio with 3 microservos, a 10A ESC and a 3-cell Li-poly pack.

## ROBART MFG.
### TURBINE UPDATES

Exclusively distributed in North America by Robart, the FunSonic USA line of turbine engines features state-of-the-art CNC-machining and is manufactured to the highest tolerances. The light, FS52AS and FS52ASX full-auto-start turbines weigh only 1.5 pounds each. The 52AS produces 12 pounds of thrust at 160,000rpm, and the 52ASX produces 13.5 pounds at that rpm. Each has a diameter of only 3.2 inches and is 9.2 inches long. Both use propane or butane for startup and run on K1 kerosene with 5-percent turbo oil mixed with the fuel. The FS52AS costs $2,295 and the FS52ASX, $2,445. Also on display by Robart was the yet-to-be-released FS120AS 30-pound-thrust turbine engine.

TECH BREAK THROUGH

## EVOLUTION
### GASOLINE ENGINES

Pilots of big scale planes can now enjoy the Evolution experience—ease and efficiency—with this new line of gas engines. All are built specifically for RC model airplane use and feature superior porting technology and electronic ignition systems that provide the no-fuss flying for which Evolution glow engines are famous. Available in three sizes: 26GT (26cc), $399.99; 35GT (35cc), $449.99; and 58GX (58cc), $599.99. They come equipped with pre-set, user-friendly Walbro carburetors.

## E-FLITE
### BLADE CP

The Blade CP has to be the first truly ready-to-fly, collective-pitch micro heli to hit the market. This sophisticated heli achieves cutting-edge performance with a 370 motor, a 4-in-1 receiver, mixer, ESC and gyro unit, 3 servos and a 6-channel radio. Each Blade CP is test-flown at the factory to ensure that it performs well right out of the box. Just charge the included 9.6V NiMH battery and add 8 AA batteries to the transmitter for versatile indoor and outdoor heli flight. The best part is that this complete package costs only $220.

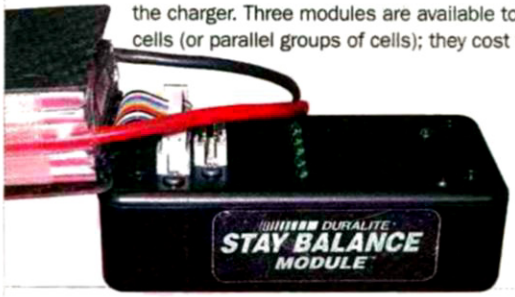
## HOBBY LOBBY INTL.
### RAVEN

With a wingspan of 40 inches, 310 square inches of wing area and a flying weight of only 20 ounces, the Scorpio Raven delivers performance plus! When powered by the recommended brushless outrigger motor, a brushless ESC and a Li-poly pack, the Raven has more than a 1:1 power-to-weight ratio and will fly for 8 to 10 minutes. The model has wire landing gear, foam wheels, wheel pants, stick-on graphics and painted foam parts for quick assembly. The hollow, removable wing has a wooden main spar and prehinged ailerons.

TECH BREAK THROUGH

## DURALITE
### STAY BALANCE MODULE

The new Stay Balance Module is more than a voltage-limiting device. This unique, cell-balancing module optimizes pack capacity and performance. It examines every cell (or parallel group of cells) in a pack and equalizes their voltage. This "smart" balancing increases a cell's capacity and cycle life, thereby helping to prevent the pack from being over-charged because the cells are balanced before they're connected to the charger. Three modules are available to handle 2 to 6 cells (or parallel groups of cells); they cost from $26 to $75.




## AERO-MODEL
### E3D ARF

Designed by Gary Wright, this 48-inch-span flyer is a proven design that's capable of full 3D flying. The production prototype has executed hovering, torque rolls, elevator/parachutes, harriers, blenders, knife-edge slips and the usual aerobatic maneuvers. Priced at less than $160, the E3D ARF comes completely built and covered and features laser-cut wooden parts, a comprehensive instruction manual, CA hinges, control horns, pushrods, clevises, landing gear, ultralight wheels and wheel collars, landing-gear straps and basic hardware.

OVER THE TOP

## HANGAR 9
### SHOW TIME 4D 90 ARF

Looking to enter the world of aerobatics? Why not try out this cool design by Mike McConville? It's perfect for elaborate aerobatic maneuvers. The Show Time 4D incorporates the new SFG Technology; removable Side Force Generators are attached to the middle of each wing and provide extra rudder authority. The 4D has excellent, slow, knife-edge flight to help it fly extreme 3D aerobatics. Specs: wingspan, 66 in.; wing area, 900 sq. in.; weight, 8 to 9 lb.; $260.

CROWD PLEASER

## SIG MFG.
## SUN DANCER 50 BIPLANE


The new Sig Sun Dancer 50 is more than just a pretty face: it's a spunky, easy-to-assemble aerobatic biplane. Just like its bigger brother, the Sun Dancer 50 comes with paint-matching fiberglass wheel pants, an engine cowl, aluminum landing gear and cabane struts. A comprehensive hardware package and a fully illustrated assembly manual are also included. With a 48-inch span, it requires a .46 to .53 2-stroke or a .56 to .72 4-stroke engine and is covered in Sig AeroKote in two schemes: yellow, orange and red or purple, white and violet.

CROWD PLEASER

## PLANES PLUS
## X-TREME COMPOSITE 33% EDGE

For the ultimate in extreme aerobatics, this fully molded, composite 33% Edge is hard to top. Available in several one-color, standard and fantasy paint schemes, the 33% Edge is designed for an 80 to 100cc displacement engine. Its wingspan is 101.5 inches, and it has 1,760 square inches of wing area. The fuselage is 92 inches long, and its flying weight is between 25 and 27 pounds, depending on the radio gear and engine used.

## SKYSHARK RC
## MESSERSCHMITT ME-109G

If you want to be in the Luftwaffe, the new Messerschmitt Me-109G is your weapon of choice. Built in 1/6 scale, the 109G has a 65.2-inch span and 706 square inches of wing area. It is designed to be powered by a .60 to .75 2-stroke or a .72 to 1.00 4-stroke. The kit features laser-cut wooden parts, full-color plans, photo-illustrated instructions, a fiberglass cowl and a formed-plastic canopy. Also included are vinyl decals; formed-wire landing gear; scale, formed plastic parts; a scale cockpit kit and much, much more! At less than $300, this fighter will make you an ace!


## RICHMOND RC
## VMAR L19 BIRD DOG ARF

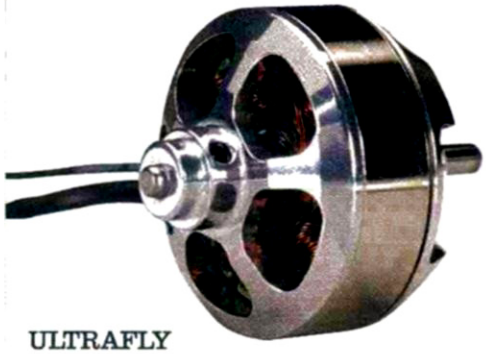
This all-wood, laser-cut ARF is made of balsa and lite-ply. It's covered in Richmond's exclusive Polycote ECS-enhanced covering that has all the graphics printed in it, so there's nothing to pull loose. The L19 Bird Dog is available in two trim schemes: the U.S. Army red trim and the USAF yellow trim. Also available in electric and glow versions. Specs: wingspan, 48.5 in.; wing area, 335 sq. in.; weight, 23 oz.

## TEJERA MICROSYSTEMS ENGINEERING XTREMA


This new product is tailor-made for the hot, explosive electric-flyer market! The Xtrema is a Li-poly battery charger, a wattmeter and a motor driver—all in one package! It's ideal for taking to the flying field, and it's a perfect tool for workshop experimenters.

## COX MODELS
## PITTS

Cox is well known for its long history of producing ½A engines and ready-to-fly control-line models, and to celebrate its 60th anniversary, it has introduced an impressive line of RC models. This new line is called "Wings," and its premiere model is the famous Pitts. This striking model spans 72 inches and has a wing area of 1,721 square inches. It is designed for a 50 to 75cc engine and requires a 4-channel radio system with heavy-duty servos. Flying weight is projected to be 16 to 18 pounds. We can't wait to get our hands on this beauty!

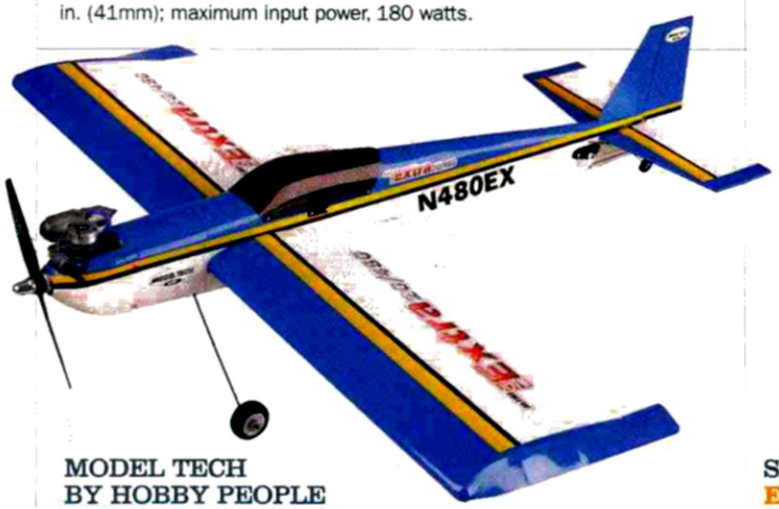


## ULTRAFLY
## BRUSHLESS MOTORS

Designed for 3D models and park flyers, these new, sensorless, brushless motors have a unique patented design that forces the magnet to hold its position when the prop stops suddenly when turning at high rpm. They deliver excellent acceleration for hovering and for aggressive aerobatic maneuvers. Available in three versions, the B/06/10 (12A), B/06/12 (14A) and B/06/15 (16A) motors each cost $69.99. Specs: shaft diameter, 0.125 in. (3.17mm); shaft length, 0.45 in. (11.5mm); diameter, 1.28 in. (32.5mm); length, 1.6 in. (41mm); maximum input power, 180 watts.

## MS COMPOSIT USA
## HORNET X-3D

When it was introduced, the MS Composit Hornet II took the micro-heli world by storm. Now, the Hornet X-3D is set to raise the bar for all-out micro-performance, as it has many refinements. In this smart-looking heli's bag of tricks are improved Bell-Hiller control, an autorotation unit, weighted carbon-fiber blades, improved battery placement and an aft-mounted tail-rotor servo for accurate control. The canopy has been factory trimmed and finished and is ready to install. The X-3D uses proven CCPM mixing and requires a heli radio system. This is one micro bird that won't be held back.




## MODEL TECH
## BY HOBBY PEOPLE
## MINI MAGIC EXTRA 20/480 ARF

With a .15 to .20 2-stroke, a .30 4-stroke glow engine or a Multiplex 480 BL4T geared brushless motor, the Mini Magic Extra offers high-performance aerobatics in a small, convenient airframe. With its detailed color scheme and light, factory-assembled wooden airframe, it's a sport plane that truly feels "sporty." Specs: wingspan, 35.5 in.; wing area, 368 sq. in.; length, 35.5 in.; weight, 28 to 38 oz.; wing loading, 11 to 15 oz./sq. ft.


## SIG MFG.
## E-FORCE ARF

Combining old and new design features, the Sig E-Force electric ARF delivers impressive 3D performance. Its profile fuselage and wing structure are reminiscent of classic stunt U-control designs, and its included HiMax brushless 980kv motor and APC 9x4.5 prop deliver a 1:1 power-to-weight ratio. With a 31.5-inch span, this 3D flyer features laser-cut balsa parts and is built to last! It requires a micro, 4-channel radio system with 4 microservos, an 11.1V, 900mAh Li-poly battery pack and a 10A brushless, sensorless ESC.


## ULTRAFLY
### SUKHOI SU-27 & F-16

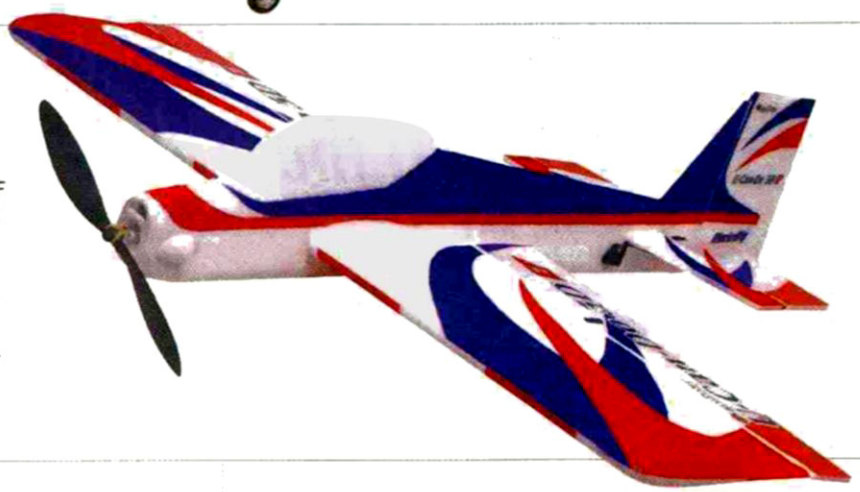
Just the ticket for jet jocks who want some Top Gun action, Ultrafly's F-16 and SU-27 replicate these famous jet fighters in smooth foam with high-quality hardware and a choice of brushed or brushless electric motors. The SU-27 has a 26.4-inch wingspan and is 35.8 inches long. The F-16 has a 25-inch wingspan and is 33 inches long. Both pusher-prop jets are light and durable and have only a few interlocking parts. With the Falcon 400 brushed motor, each costs $85.99; with a D/13/32kv brushless motor, the cost is $159.99. Both versions include a 3:1 ratio gearbox and an APC prop.

## ROBART MFG.
### F-8 CRUSADER

Now available from Robart Mfg., this all-composite ARF semi-scale F-8 Crusader is just the aircraft for the FunSonic 12-pound-thrust FS52AS turbine. With a wingspan of 60 inches and a 65-inch length, the Crusader weighs 18 pounds. The kit costs $899 and is also available with retractable landing gear for $1,225. If you have a soft spot for early jet-age designs, the shoulder-wing F-8 is a great choice with which to earn your turbine rating.


## GREAT PLANES MODEL MFG.
### U-CAN-DO 3D ELECTRIC ARF

This highly maneuverable, virtually indestructible ARF from Great Planes is a park flyer and a 3D trainer all in one! It's an ideal second model that maneuvers comfortably at slow speeds in a small area. And all pilots will appreciate the durable FlightFlex construction that allows it to bounce back from mishaps and fly again! A prop, a 280 ball-bearing motor and a 5:1 gearbox are included. Specs: wingspan, 33.5 in.; wing area, 368.5 sq. in.; weight, 15 oz.; wing loading, 5 to 6 oz./sq. ft.; length, 36.5 in.; $64.99.



## SAITO
### FA-220A 4-STROKE

When it comes to maximizing power, there really is no substitute for cubic-inch displacement! The new Saito 4-stroke, single-cylinder FA-220A engine uses the one-piece, hemispherical head design that gives all Saito engines their impressive power-to-weight ratios—a full 2.2ci of combustion in a case that's barely bigger than a 1.80's. Whether you want to power a 27% IMAC plane or a giant-scale Cub, no other single-cylinder 4-stroke engine comes close to giving you this much displacement with so little weight. The FA-220A 4-stroke costs $499.99, and the FA-220A 4-stroke Golden Knight costs $524.99.


## IKARUS USA
### VIPER 70 ELECTRIC HELICOPTER

The new Ikarus Viper 70 represents a milestone in micro-heli development. This fully ball-raced heli uses a CCPM control system and an innovative, belt-driven, two-stage gear-reduction tail rotor. Instead of a wire pushrod to control tail-rotor pitch, the Viper 70 uses a unique rotary system that eliminates all the slop and binding that's typical of pushrods. At $279, the Viper 70 is 3D-capable right out of the box, and it requires only a heli radio and a suitable power system.


## PARKFLYERS.COM
### CESSNA 182

This Cessna 182 is a true-to-scale, RTF, 3-channel RC aircraft. Its terrific looks make it super-realistic when airborne and on the ground. This extremely stable aircraft can maintain flight at very slow speeds, thereby permitting novices to master it easily. The Cessna 182 is made of strong Styrofoam and powered by a high-torque, 7.2V motor and an 8.4V, 1000mAh NiMH pack that provides up to 18-minute flights. A quick-charger is included. Specs: wingspan, 38.5 in.; length, 29 in.; weight, 21 oz.

## WILD HARE R/C
### ULTIMATE

If you've been hunting for a 29% Ultimate 10-300 aerobatic ARF, the Wild Hare Ultimate is your target! This impressively built biplane has a 64-inch span and is 70 inches long. It is designed for a 50 to 62cc gas engine, and it sports 1,450 square inches of wing area. With an introductory price of just under $470, the Ultimate has Oracover film covering, laser-cut wooden parts, hinge holes (predrilled for Robart HingePoints), built-up one-piece wings, strong aluminum landing gear, a fiberglass engine cowl and wheel pants that come painted. The cowl and firewall are mounted, and engine side thrust is built in.

## MODEL TECH
### 3DEMON FREESTYLE ARF

The 3Demon is a hot plane with sizzling performance. Huge control surfaces combined with a light wing loading and a thick airfoil let you perform any uncivilized maneuver you can imagine. The 3Demon also features precision laser-cut parts, iron-on covering, formed landing gear, a factory-painted fiberglass engine cowl, a molded canopy, a complete hardware package and a detailed instruction manual. Each control surface has its own servo, so you can set each up for basic throws or take advantage of advance control mixing. Specs: wingspan, 52 in.; wing area, 780 sq. in.; length, 53 in.; weight, 64 to 72 oz; power, .36 to .46 2-stroke or .46 to .52 4-stroke; $119.99.

## HACKER BRUSHLESS MOTORS
### A20 & A30 SERIES

Hacker's A20 and A30 Series are specifically engineered for high power and high efficiency. The A20 Series is for indoor and outdoor slow-flyer and aerobatic airplanes that use Li-poly batteries. The 12-pole outrigger design creates massive torque that allows the use of large props without gearboxes. They feature oversize bearings, curved neodymium magnets and a highly efficient stator design. The new 30A Series motors are designed for larger park flyers and 3D aerobatic flyers that weigh 24 to 60 ounces. The motors come with prop adapters, mounts and screws.

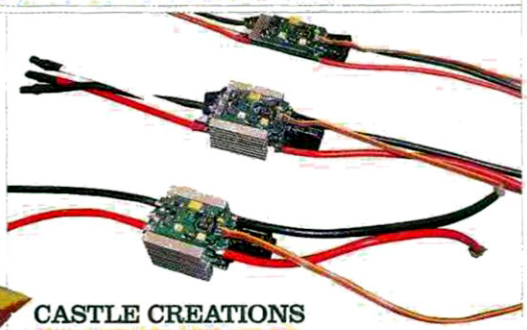

## CARL GOLDBERG PRODUCTS
### WILD STIK 40 ARF

The Wild Stik 40 ARF sets a new standard for the classic Stik design. It comes 90-percent assembled, so eager modelers can be outside flying in a weekend. The jig-built airframe and built-up wing are all wood, and that keeps its flying weight to just 4.5 to 5 pounds—considerably less than other "stik" ARFs. The Wild Stik 40 also features oversize, double-beveled control surfaces, flaps and a push-pull rudder for superb aerobatic performance. Its aluminum landing gear is durable during touchdowns. Specs: wingspan, 52.5 in.; wing area, 728 sq. in.; flying weight, 4.5 to 5 lb.; length, 44 in.; engine req'd, .40 to .50 2-stroke or .50 to .70 4-stroke; radio req'd, 4-channel with 7 servos; $159.99.

CROWD PLEASER

## E-FLITE
### MINI EDGE 3D ARF

Now you can have a mini airplane that is not made of foam. The new Mini Edge 3D ARF from E-flite is a sharp-looking model that offers great performance. This balsa built-up plane comes expertly covered with Ultracote and can be assembled in a few evenings. Attach a powerful brushless motor to the front, and you have a 3D-capable aircraft that you can fly in your backyard. Specifications: wingspan, 37.25 in.; wing area, 297 sq. in.; length, 34 in.; weight, 24 to 26 oz.; $99.99.



## CASTLE CREATIONS
### PHOENIX HV ESCS

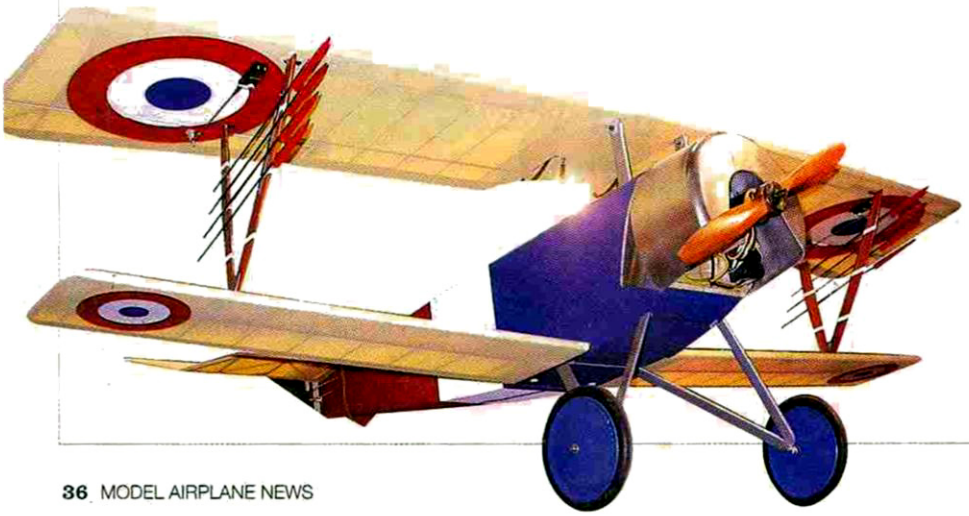
Long known for its high-quality brushed and brushless ESCs, Castle Creations is proud to announce the release of its high-voltage (HV) ESCs rated at 45, 85 and 110 amps. Each has a built-in heat sink and features the full range of Phoenix programming options. Each can handle up to 36 Ni-Cd/NiMH cells or up to 12 Li-poly cells. Though they have a high current capability, the HVs are a compact, lightweight alternative to other controllers.

## KANGKE SUPERKRAFT
### CAP 232 SPORT

This great new release from Kangke is perfect for aerobatics. Its large control surfaces and light wing loading make it an excellent aerobatic trainer on low rates. On high rates, it's outstandingly 3D-capable. The kit includes a finished fiberglass cowl, APS wheel pants, complete hardware, sturdy aluminum main gear and more. Specs: wingspan, 61 in.; wing area, 846 sq. in.; length, 59 in.; weight, 5 to 6 lb.; $257.77.


## THUNDER TIGER
### GILES 202 ARF

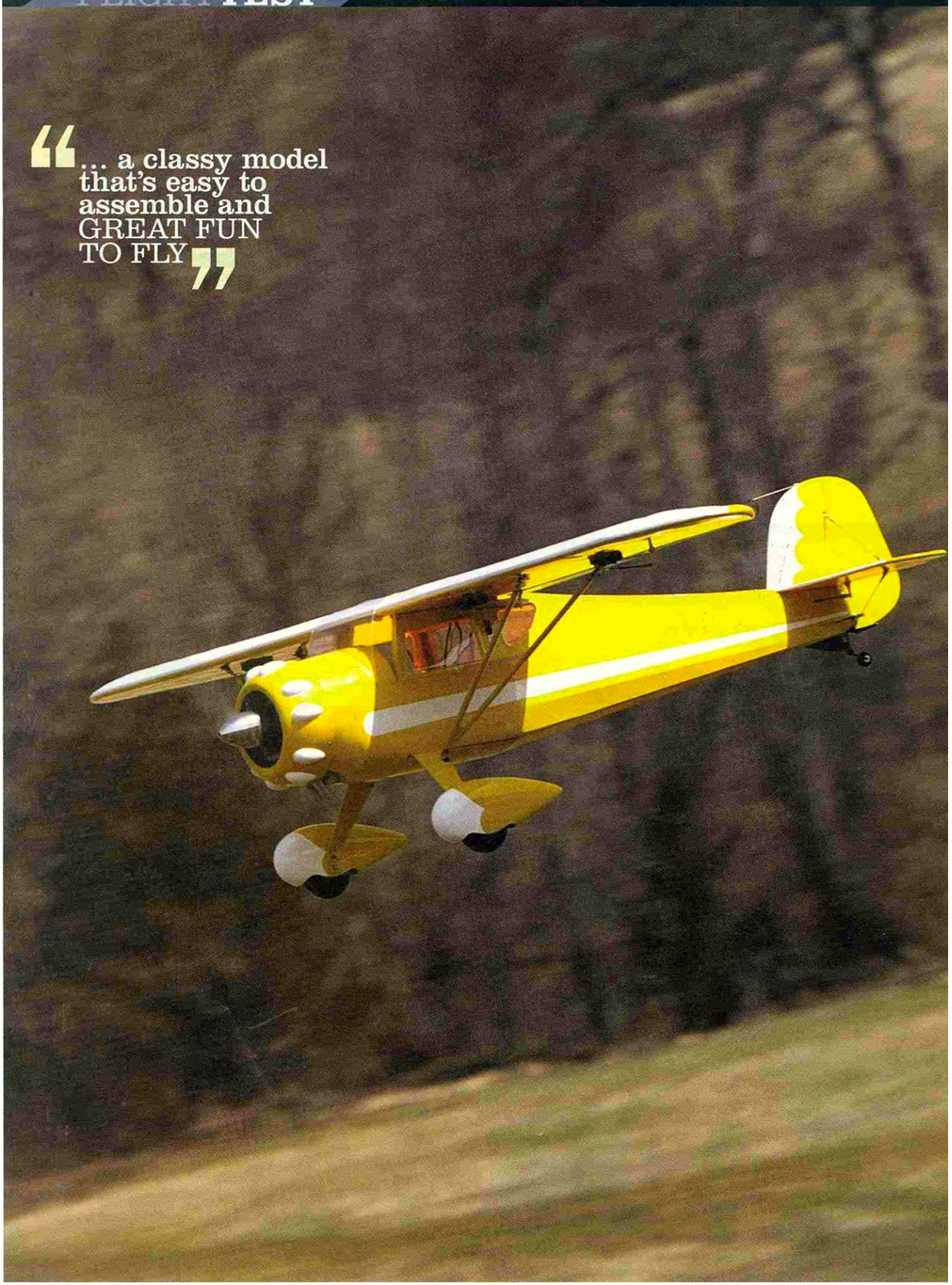
This nicely built, balsa-and-ply, 70-inch-span Giles 202 ARF is covered with Ultracote. Assembly takes only a few hours, and with the recommended engine, it will perform an exciting airshow. Its large control surfaces provide crisp aerobatics, just as a replica of the world-famous airplane should. Designed for a 1.08 to 1.60 2-stroke or a 1.20 to 1.80 4-stroke engine, the model weighs between 10 and 10.5 pounds. It requires a 4-channel radio with 6 servos and costs $325.



## BALSA USA
### 1/4-SCALE NIEUPORT-11

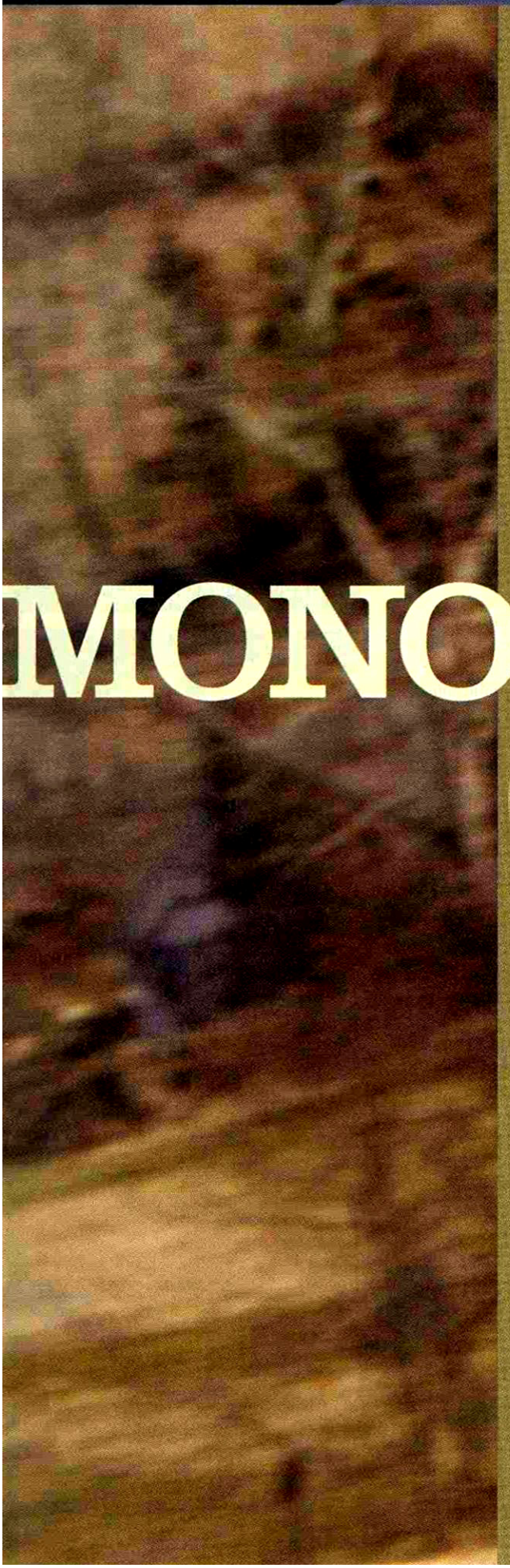
With a flying weight of only 11 pounds, the Nieuport 11 was designed for flying, flying and more flying! It's intended for electric power, but it can also be flown with gas or glow. When it's E-powered, its gentle, predictable flight characteristics make it an exceptional performer: it easily loops from level flight and turns on a dime, just as any worthwhile WW I fighter would have! Specs: wingspan, 73 in.; wing area, 1,450 sq. in.; weight, 12 to 14 lb.; length, 61 in.; power req'd, Axi 4130/20 motor or .90 to 1.20 4-stroke glow (23cc gas) engine; $199.95.

*See the Source Guide on page 151 for manufacturers' contact information.*



"... a classy model that's easy to assemble and GREAT FUN TO FLY"

BY RICK BELL > PHOTOS BY PETE HALL



# Kangke MONOCOUPE 60/90 ARF

## A timeless aviation classic

**AN OLD SAYING IN AVIATION CIRCLES GOES,** "If it looks right, it will fly right." Most pilots will agree that many aircraft designs from the Golden Age of aviation fit this old adage, and the Monocoupe 90A is at the top of the list. A couple of years ago, Super Kraft released its giant-scale Monocoupe that proved to be very popular, but not everyone wanted a giant-scale model. So in response to heavy customer demand for a smaller version, Super Kraft downsized its timeless aviation icon. With its sleek lines, round, blistered cowl and oversize wheel pants, this classy model retains all the charm and great flying characteristics of its larger brother but in a much smaller format.

## SPECIFICATIONS

**MODEL:** Monocoupe 60/90 ARF
**MANUFACTURER:** Super Kraft
**DISTRIBUTOR:** Kangke
**TYPE:** semi-scale ARF
**WINGSPAN:** 76 in.
**WING AREA:** 865 sq. in.
**LENGTH:** 52 in.
**WEIGHT:** 9 lb. 5 oz.
**WING LOADING:** 24.8 oz./sq. ft.
**ENGINE REQ'D:** .60 to .90 2-stroke or .91 to 1.20 4-stroke
**RADIO REQ'D:** 4-channel w/5 servos, or 5-channel w/7 servos for optional flaps
**PRICE:** $299

## COMMENTS

Easy to build and fun to fly; what more is there to say?

## HIGHLIGHTS

- Excellent quality
- Assembles fast and straight
- Classic looks
- Very good flight characteristics

### WHAT YOU GET

The Super Kraft Monocoupe 60/90 ARF is handmade of select balsa and high-quality lite-ply and covered in UltraCote iron-on film; the sharp-looking scalloped trim scheme is factory-applied. The professionally painted fiberglass cowl and wheel pants are beautiful, and the color match is exceptional! The optional working flaps are new. To make them operational, you'll need a 5-channel radio with 7 servos. The rest of the package includes sturdy painted-aluminum landing gear, finished wing struts, functional tail wires, a complete hardware kit and a detailed instruction booklet. That's quite an impressive package!

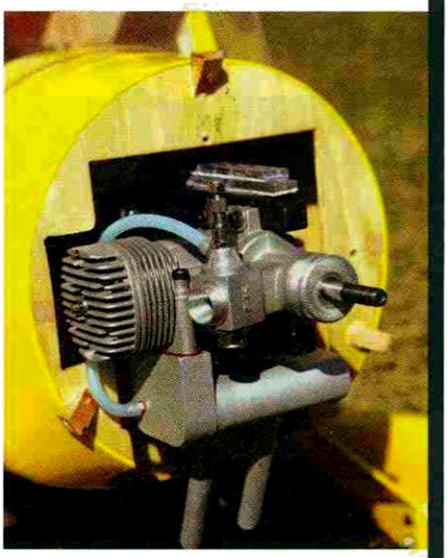
### ASSEMBLY NOTES

As do other Super Kraft models, the Monocoupe assembles quickly because the parts fit together so well. The covering was drum-tight and didn't require touchup with a covering iron, and all of the glue joints were tight and gap-free. Similar to the giant-scale Monocoupe's, the nose of the Monocoupe 60/90's fuselage uses a sub-cowl to surround the engine, to which the fiberglass cowl is then mounted. The two-piece wing is bolted to the fuselage from the inside, and a substantial aluminum tube ties the wing panels together.

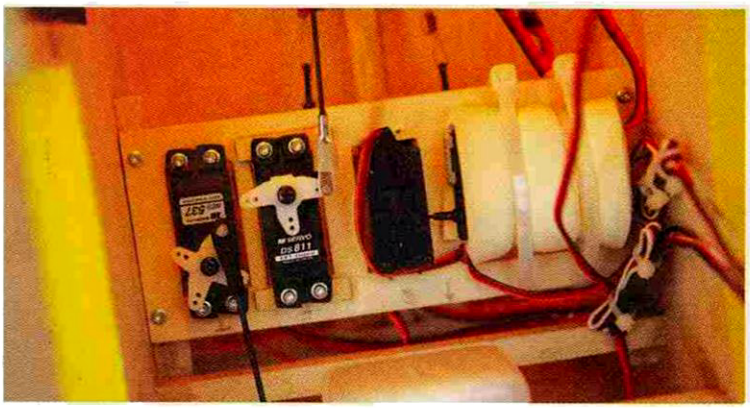
I powered the Monocoupe with an SK Engines .80 2-stroke and a Tiger Shark Pitts-style muffler. To add that final touch, I added a Kangke polished-aluminum spinner.

**Cowl and engine installation** Unlike other ARFs that start with the wing, begin the Monocoupe by mounting the cowl on the sub-cowl. Then place a ruler across the cowl opening and measure the depth to your work surface. This measurement plus 3/8 inch is the distance from the firewall to the engine's thrust washer.

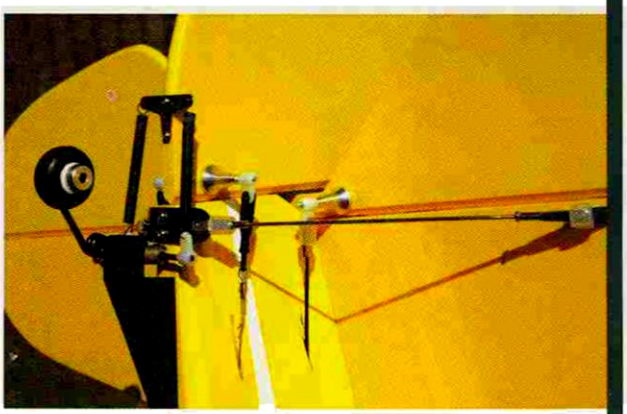
Before I proceeded any further, I bolted the landing gear to the bottom of the fuselage, making it a stable platform to work from. Following the instructions, I drew centerlines on the firewall and installed the engine mounts. Using the measurement taken earlier, I installed the engine, the sub-cowl and the fiberglass cowl and finalized the



The SK Engines .80 and Pitts muffler fit well within the sub-cowl.



Radio installation is neat and tidy. The rudder servo is screwed to the underside of the servo tray.



A Y-pushrod drives the elevators, while the rudder uses a pull-pull system.

muffler installation. This part of the assembly went quickly and without any problems.

**Tail feathers** The tail feathers are built of balsa sticks, and aligning and gluing them to the fuselage is very straightforward. For extra strength, the fin has a large tab that is inserted into a slot in the stab. This and the tail-bracing wires make for a solid tail assembly. Just make sure that as you align the fin, you use a ruler to ensure a straight hinge line between it and the lower fuselage. I made and fitted the flying wires but left them off until later.

Next, add the tailwheel assembly, and hinge the elevators and rudder. I added the control horns before I hinged the control surfaces, as it's a lot easier to handle just the parts and not the entire fuselage assembly. The aluminum control horns use a single through-bolt with a finishing washer for easy installation. The elevator uses a single pushrod that ends in a "Y" (you could eliminate the "Y" because the elevator is a single unit) that you must assemble, and the rudder uses a pull-pull system for solid control. I installed the elevator pushrod and rudder pull-pull cables and hooked them up to the rudder and elevator. Then I reinstalled the tail's flying wires.

**Radio installation** First, mount the servo tray in the fuselage, and make sure that it doesn't interfere with the fuel tank. Then screw the elevator and throttle servos to the top of the tray and the rudder servo to the underside of the tray. It is then simple to adjust the elevator pushrod and rudder pull-pull cables and attach them to the servos. I made up the throttle pushrod, plumbed the fuel tank and installed it behind the firewall. The tank has a cutout molded at its rear that rests on a support stick. This prevents the tank from sliding backwards.

I then assembled the wheels and added the wheel pants, followed by the fuselage belly pan. With the exception of the window installation, the fuselage was complete.

**Wing assembly** The Monocoupe has optional flaps; before you start assembly, decide whether you want them to be operational, as they are part of the ailerons and need to be cut free. Top-hinge the ailerons and flaps; then place a strip of covering material over the hinge line and iron it on. This seals the hinge line, adds strength and increases control response.

PHOTO COURTESY OF EXPERIMENTAL AIRCRAFT ASSOCIATION

## THE MIGHTY MONOCOUPE—LEGEND IN A SMALL PACKAGE

**TRYING TO CHARACTERIZE THE MONOCOUPE IN A SHORT ESSAY** is like trying to explain icons such as Jimmy Stewart, George Patton, or the P-51 Mustang in 25 words or less. In its time, the Monocoupe stood tall as the first truly high-performance airplane that was available to the average pilot.

When the Monocoupe first appeared in 1930, aviation was just beginning to leave its big-biplane roots behind. Even though the stock-market crash of '29 had ripped the guts out of the nation's economy, aviation fever was so strong that companies sprang up everywhere to capitalize on it. Names like WACO, Beechcraft, Cessna and so many others popped up during a seemingly illogical time: how could people buy airplanes without any money? But the lure of aviation was so strong that "sportsman pilots" kept the newly hatched aviation industry alive, and the Monocoupe was right out in front getting much of the glory.

Compared with the biplanes that preceded it, the Monocoupe was tiny. The cockpit was only as wide as two fairly small people, and its long, single-piece wing, with its massive spar running uninterrupted through the top of the cabin, was a masterpiece of woodworking. The high aspect ratio wing gave the airplane plenty of lift, but the tiny cabin and fuselage kept drag to a minimum.

As the engines became bigger, the windshield appeared to be an afterthought; it assumed the proportions of a mailbox slot. When the little 90hp Lambert radial was bolted to the nose and surrounded by a wind-cheating cowl, the airplane delivered what was considered to be blazing performance: 110mph at cruise and 130mph at top speed, along with a 900-feet-per-minute climb. Compared with its competition—all hulking biplanes—that was lightning fast.

The Monocoupe appeared on stage just as air racing was becoming a spectator sport second only to baseball. In addition to the hairy-chested special racing airplanes, classes were developed for certified airplanes so that casual Sunday pilots could rip around the pylons. If they weren't flying Monocoupes, though, they didn't have a chance of winning. Enter Johnny Livingston.

Livingston recognized the potential of the Monocoupe and began making his own modifications in the form of aerodynamic fairings to increase speed. His 90A was quickly replaced by a 110hp version, and then he went one step further and talked the factory into clipping the wings to eliminate the plane's induced drag. The resulting 110 Special so dominated the field that the factory eventually certified the "clip wing 'Coupe" and built seven of them powered by 145hp Warner radials. The short-wing 110 Specials became legendary, both as racers and as aerobats.

The 90A 'Coupe went through a number of changes, and the factory went through the usual ups and downs of business. It finally closed its doors for good right after WW II. The last Monocoupes were 90ALs, with their lovely round engines replaced by far more efficient, flat Lycoming engines that lacked their predecessors' charisma.

Today, "Monocoupe" is one of those words that's usually spoken with a hint of reverence and a knowing look. It isn't just an airplane of a particular era; to many, it is *the* airplane of the 1930s.

*—Budd Davisson*
*Visit Budd on the Web at airbum.com*

## IN THE AIR

This is where the fun really begins! The Super Kraft Monocoupe 60/90 ARF is a charming model to fly. The SK Engines .80 2-stroke has more than enough power to pull the model around rather quickly. After a few laps around your field, you'll be very comfortable with its flight characteristics.

### CONTROL THROWS

**Aileron:** 3/4 in. up, 1/2 in. down; 25% expo
**Elevator:** ±1 1/4 in. (high); ±3/4 in. (low); 20% expo
**Rudder:** ±2 1/2 in. (high); ±2 in. (low); 20% expo
**Flaps:** 1/2 in. (takeoff); 1 in. (landing)

### GENERAL FLIGHT CHARACTERISTICS

**Stability:** as you would expect from a high-wing model, the Monocoupe is stable yet very maneuverable.

**Tracking:** this is one groovy model! Unlike most high-wing models, the Monocoupe tracks like an aerobatic thoroughbred. Control response is very good.

**Aerobatics:** though the Monocoupe is not a pattern-type aircraft (nor does it claim to be), it can perform just about any maneuver with style and grace.

**Glide performance:** the Monocoupe glides well; just keep the nose down to sustain airspeed and reduce the risk of stalling.

**Stalls:** in a low-speed stall, it just drops forward but doesn't tip-stall, and there isn't any loss of control.

### PILOT DEBRIEFING

On takeoff, apply up-elevator to keep the tail on the ground until a moderate speed is reached. When the tail comes up, the Monocoupe will leave the ground with just a nudge of up-elevator. The rudder has a lot of authority, so be careful not to oversteer. I found that the Monocoupe flies well at all speeds, and I didn't notice any trim changes from high to low speeds. I was able to do beautiful large round loops, beautiful rolls and stall turns that pivoted on a dime.

Turns are best done by coordinating rudder with aileron. Start the turn with aileron, and then add some rudder to help the nose come around. If you set up differential throw as recommended in the instructions, rudder use will be minimal.

Landing the Monocoupe is very easy. Because it tracks so well, you need only line it up with the runway's centerline and manage the throttle until touchdown. I also played with the flaps, and I've landed it with the flaps retracted and extended. When fully extended, the flaps really slow the Monocoupe down, and you need to carry some extra throttle. All in all, the Super Kraft Monocoupe is a fun model for a relaxing day at the field.

Add the aileron and flap servos (if used). The linkages for ailerons and flaps are easily hooked up using the supplied hardware; the linkage setup for the flaps is a little different, however. When the flaps are retracted, the servo arm is in line with the flap control horn, making a very rigid linkage setup. This setup ensures that the flaps return to the same retracted position and also eliminates the need for a reversing servo.

Locate the holes in the bottom of the wing for the wing-strut brackets, and screw them into place, but don't fully tighten them until you have installed the wing and struts on the fuselage.

**Final assembly** Attach the wing panels to the fuselage and connect the wing struts to the fuselage. Adjust the clevises on the outer ends of the struts so there is no endplay, but don't tighten them enough to distort the wing. Be sure to use a safety retainer on the clevises, and secure the bolt at the fuselage end with a locknut.

Trim the windows and windshield to shape and glue them into place—a simple process that went well. I balanced the model and shifted the battery pack around until the CG was in accordance with the instructions (I had to add 4 ounces of weight to the nose). To finish, I set the control throws as recommended and was ready to put the Monocoupe through its paces.

### PARTING THOUGHTS

Are you looking for a classy model that's easy to assemble and great fun to fly? Then look no further than the Super Kraft Monocoupe 60/90 ARF. Its construction is topnotch, as is the supplied hardware. The best part, though, is how the Monocoupe flies—just superb! Its flight characteristics are polished, and the model is very attractive, whether sitting on the ground waiting for its next flight or in the air. Pick one up today, and see what the Golden Age of aviation was all about.

*See the Source Guide on page 151 for manufacturers' contact information.*

click trip MODELAIRPLANENEWS.COM FOR VIDEO OF THE MONOCOUPE IN ACTION

## GEAR USED

**RADIO EQUIPMENT:** JR XP9303 transmitter, JR R649 receiver, 4 JR DS811 & 3 JR NES 537 servos (2 aileron, 1 elevator, 1 rudder, 1 throttle, 2 flaps)

**ENGINE:** SK Engines .80 2-stroke

**FUEL:** Morgan 15% nitro

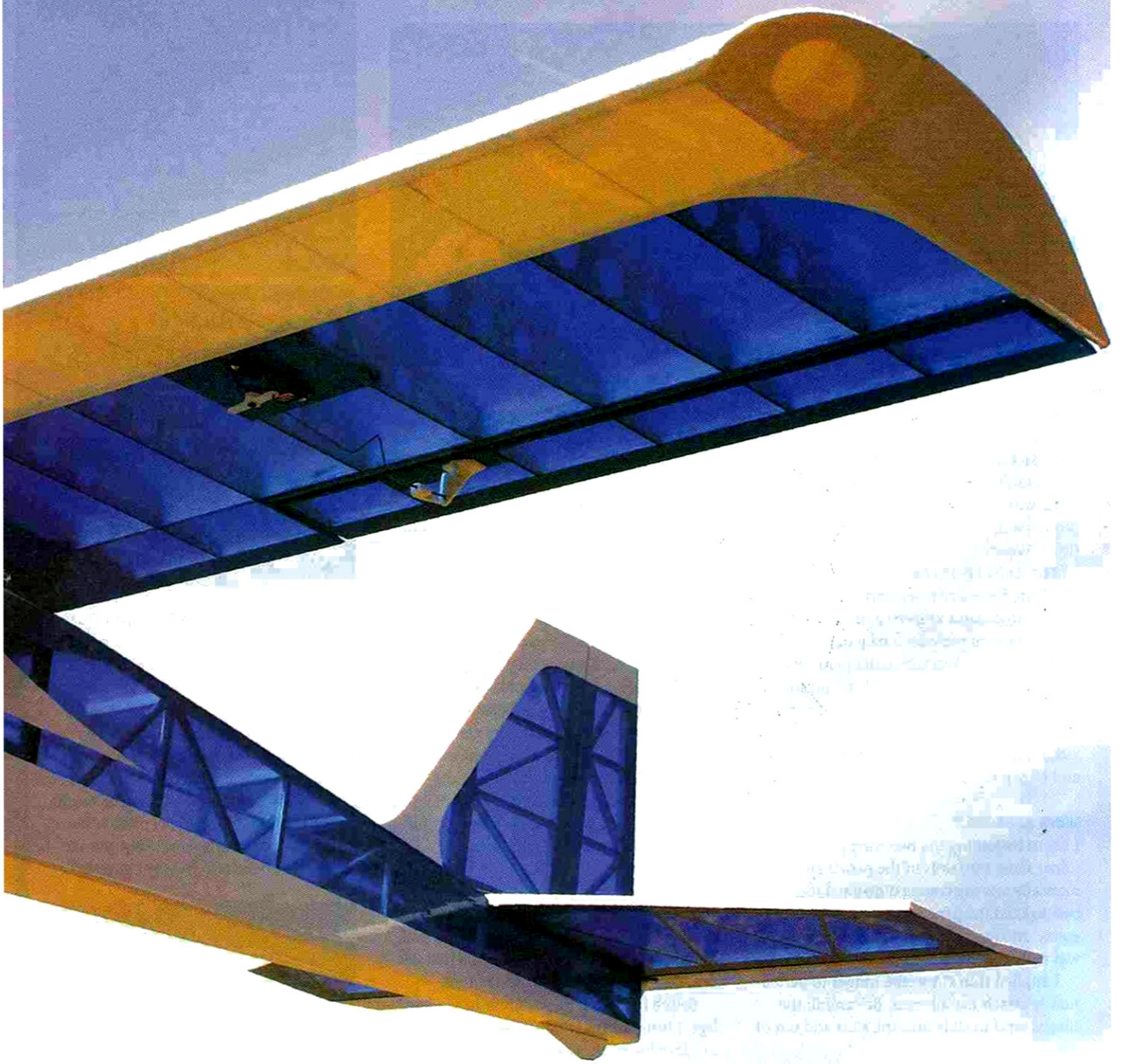
**PROP:** APC 14x8

"This gentle plane will HELP THE NOVICE PILOT learn very quickly..."

SIG MFG. Relax with this take-anywhere electric

# KADET EP

BY MIKE McGEE › PHOTOS BY MIKE McGEE & JIM SPEARS



# 42

**THE SIG MFG. LINE OF KADET MODELS IS KNOWN** for ease of control and gentle flying characteristics—qualities I appreciated as a beginning flier. My Kadet Senior saw me through many mistakes and control blunders! I recently began looking for a small model that I could keep in the car for spur-of-the-moment fun-flying. I also wanted this plane to be stable and electric-powered and to have ailerons. When I first saw Sig's new Kadet EP-42, I knew my search was over. This solid, well-built plane is constructed of balsa and plywood and covered with Sig's own AeroKote. Although Sig designed the Kadet EP-42 for beginners, I chose it because I look forward to impromptu jaunts to the flying field carrying only a plane and a transmitter—now, *that's* fun!

## SPECIFICATIONS

**MODEL:** Kadet EP-42
**MANUFACTURER:** Sig Mfg. Inc.
**TYPE:** electric trainer/intermediate plane
**LENGTH:** 34 in.
**WINGSPAN:** 42 in.
**WING AREA:** 330 sq. in.
**WEIGHT:** 26.2 oz.
**WING LOADING:** 11.4 oz./sq. ft.
**MOTOR INCLUDED:** Speed 400 w/ESC
**RADIO REQ'D:** 4-channel w/3 microservos (rudder, elevator, ailerons, throttle)
**PRICE:** $150

## COMMENTS

This easy-to-assemble ARF is a good plane for beginners and for more advanced beginners who want to make a step up to full-house control.

## HIGHLIGHTS

- Easy to assemble and looks good
- Upgraded Speed 400 motor and speed control included
- Complete hardware package

### OPENING THE BOX

I wasn't surprised to find that all of the parts were packed well and in perfect condition, but I didn't expect that the plane would come with a "souped-up" Speed 400 with a prop as well as a 30A electronic speed control (ESC). Wow!

The Kadet EP-42 comes with all of the hardware necessary to assemble it, including the pushrods (and keepers) and the control horns. Sig even provides a strip of covering material to iron over the center joint between the wing halves. A detailed, photo-illustrated, 12-page instruction manual clearly describes every step. I had to add only a 4-channel radio, a battery, a Y-harness, 3 microservos and 6-inch servo extensions.

### WING ASSEMBLY

I began by joining the two wing panels. The joiner slides into slots in the panels and automatically sets the correct dihedral. I found it best to hold the panels together while the epoxy dried to make certain that the angle was maintained.

I applied thin CA to the hinges to permanently attach the ailerons. Be careful; the hinges tend to slide into the slots and out of reach.

To hook up the aileron controls, I first strung a servo cord and 6-inch servo extension through the wing panels. Sig installed a pull string in each panel for this. After snaking the wires through the wing panels, I screwed the aileron microservos into the precut servo mounts. When you measure the pushrods and before you cut them, make certain that the servo is centered in its neutral position.

The manual suggests that you use tape to hold the ailerons in the neutral position when measuring the pushrods. I prefer to use a clothespin and two pieces of balsa to clamp the aileron trailing edge level with the wing trailing edge. The same applies to holding the rudder and elevator while measuring their pushrods.

### FUSELAGE

The motor, cowl, windshield and servo tray come installed. The manual indicates that the motor is an "upgraded" Speed 400 that offers more rpm than a standard 400. Because the brushes are exposed, the timing is adjustable.

My first step was to install two of my microservos in the servo tray. I used medium-size servo arms, and since they overlapped in the middle, I removed the inside arms and attached the pushrods to the outer arms.

I then inserted the rudder and elevator pushrods into the preinstalled, plastic pushrod tubes and attached them to the servo arms with the pre-formed Z-bends. You will have to enlarge the holes in the control arms and in the control horns for the pushrod wires.

### TAIL FEATHERS

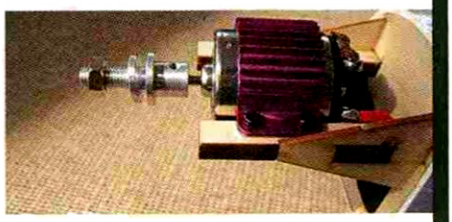
As with the ailerons, I attached the rudder and elevator hinges with thin CA. The fact that the slots are precut saves a good deal of time.

Before I attached the stabilizer to the fuselage, I installed the wing so that I could use it as a leveling guide. I set the stabilizer into place and viewed the wing and the stabilizer from a good distance in front to make certain the latter could be leveled without sanding or otherwise adjusting the seat. The alignment was perfect, but I trimmed a bit more covering from the bottom of the stabilizer to expose more wood to the glue.

I then applied 15-minute epoxy. I used a small level on the wing and another on the stabilizer to make certain that they were level with each other. Then I measured the distance from each wingtip to the corresponding stabilizer tip. I made the necessary adjustments and carefully pinned the stabilizer to the fuselage to hold it in place while the epoxy dried.

When the stabilizer epoxy had set, I trial-fit the fin into place to make certain that there was full contact with the stabilizer and the fuselage. I applied 15-minute epoxy and used a small carpenter's square to verify the 90-degree angle.

Gluing the control horns into place is straightforward; however, be careful when you measure and cut the elevator and rudder control rods. You'll then have to bend the tips 90 degrees to insert them into the control horns. Follow the instructions very closely to make sure that the bend is in the right direction.



**The supplied Speed 400 motor comes already mounted.**

**You need only install your servos and insert the rudder and elevator pushrods into the preinstalled plastic pushrod tubes.**

## IN THE AIR

The supplied hopped-up Speed 400 motor provides unusually strong performance. The Kadet EP-42 will never fly straight up, but there's plenty of power for the plane to do everything that it was meant to do and more. I hand-launched the plane and had it take off from the ground. With a firm hand-launch, the plane powers into its climb with only a slight touch of up-elevator. Ground takeoffs are just as smooth; full power and a bit of right rudder tracked the EP-42 straight down the runway, and it was off the ground within 20 feet.

### CONTROL THROWS

**Elevator:** 5/8 in. (low)
**Ailerons:** 5/16 in. (low)
**Rudder:** 7/16 in. (low)

### GENERAL FLIGHT CHARACTERISTICS

**Stability:** I found the EP-42 to be as stable as its big brother, the Kadet Senior. In up to a 2mph wind, the EP-42 is a steady flyer. In 8 to 10mph, I had to control it a little more, but this wouldn't be a problem for an advanced beginner.

**Tracking:** the Kadet EP-42 responds nicely to control inputs.

**Aerobatics:** at full power, it was possible to do a loop and a roll; however, both required a dive first to pick up speed. The roll also required applying rudder to assist the ailerons. Neither was crisp.

**Glide performance:** landings were typically problem-free. I found I could cut the power on entering the runway grid and let the light wing loading float the plane to a three-pointer.

**Stalls:** the Kadet EP-42 has such a light wing loading that you have to make an effort to stall it. It stalls gently without dropping a wingtip.

### PILOT DEBRIEFING

A new pilot should handle the plane within the recommended control throws. As the pilot gains experience, he or she will probably want to increase the throws for greater maneuverability. On landing, the wing loading of the EP-42 is so light that it almost floats itself in. Three-point landings are quite easy, and since grass often presents a problem when landing small planes, a gentle flare to almost a one-pointer on the tailskid is possible—and sometimes desirable. Flying the EP-42 is a pleasure. I've used the word "easy" so many times in describing it that perhaps Sig should rename it the "EZ-42." It's ideal for first-time fliers because this gentle plane will help the novice pilot learn very quickly. I also recommend it to more experienced pilots who want to go to the field with only a plane and transmitter, have fun flying and quickly return to home or work.

I removed the elevator output arm from the servo so I could pull the pushrod out of the back end far enough to measure, cut, bend and attach it to the elevator control horn.

### LANDING GEAR

With the fuselage completed, it was time to install the landing gear. The aluminum gear was simple to assemble with the included parts, and I used screws to attach it to the fuselage at the predrilled holes. To make certain that the axle bolts were secured permanently to the legs of the landing gear, I applied Loctite to the nuts.

## GEAR USED

**RADIO:** Futaba 6X transmitter, GWS FM micro-receiver and 4 Hitec HS-55 servos

**MOTOR INCLUDED:** Speed 400 w/ESC

**PROP INCLUDED:** 7x5 EP

**BATTERY USED:** Sanyo 1300mAh, 7-cell NiMH

### RADIO INSTALLATION

Using the supplied Velcro®, I easily installed my receiver in the forward compartment. I ran the leads from the servos and the supplied ESC to it through holes in the servo tray. I was pleasantly surprised to find that the ESC comes with a switch. To install it, you must place the switch against the precut hole from the inside. This leaves the cover plate on the inside, so inserted from the outside, the screws must be placed in exactly the right positions to meet the mounting holes in the switch. Solution: cut the covering away from the precut hole, pull the switch and wiring to the outside of the body, lay the switch on its side next to the outside of the hole and mark where the screw holes should be. Be sure to cut the covering here very carefully because you won't have a cover plate to hide any ragged edges.

Insert the battery pack through the neat trap door in the bottom of the fuselage and secure it with the wraparound Velcro® tube that's permanently attached to the bottom of the radio/servo tray. You can adjust the battery position inside the tube to balance the plane. I also applied Velcro® to the battery pack itself to prevent it from sliding.

### PREFLIGHT CHECKS

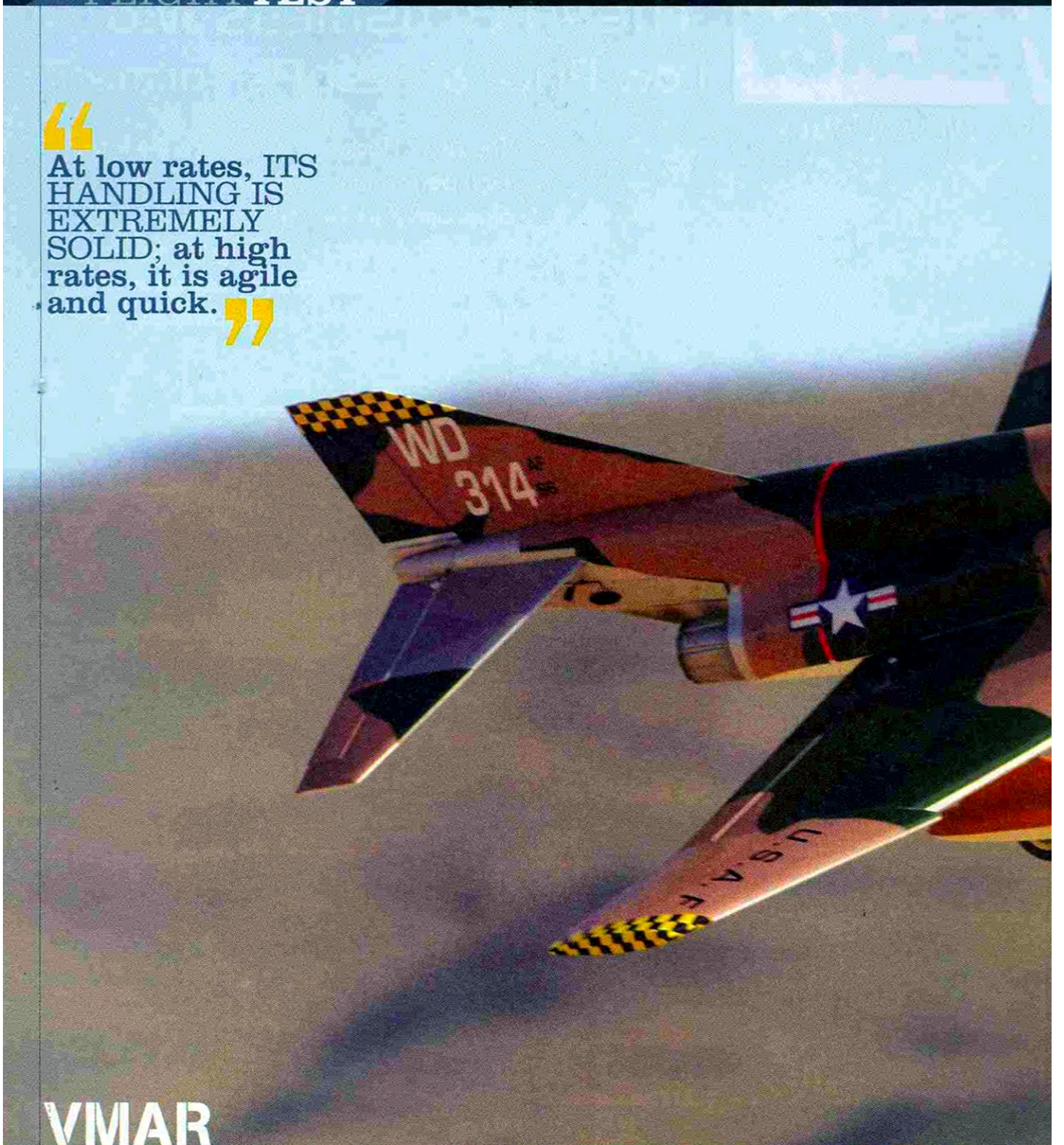
After I had hooked up the battery and balanced the plane, I checked the system to make certain that the servos were working and that the ailerons, rudder and elevator were moving in the right direction. When I used pliers to change the V-bend in an aileron control rod, it broke. When I tried to make a similar adjustment to the rudder control rod, it cracked. I called Sig to report these events and learned that the company is now using thinner, more pliable wire for the control rods.

I set the recommended throws for the four control surfaces and was ready to fly.

### CONCLUSION

The Kadet EP-42 is easy to assemble, and the inclusion of a Speed 400 motor and speed control is a nice touch that removes any guesswork. In the air, the Kadet EP-42 has the nice, stable flight characteristics that Kadets are known for. It's also good-looking and quite impressive at the field. First-time fliers will have no trouble learning on this plane, and more advanced pilots will enjoy the EP-42 when they want relaxed flights and lazy maneuvers. I highly recommend it not only as an aileron-equipped trainer, but also as a fun-flying plane that you can take just about anywhere.

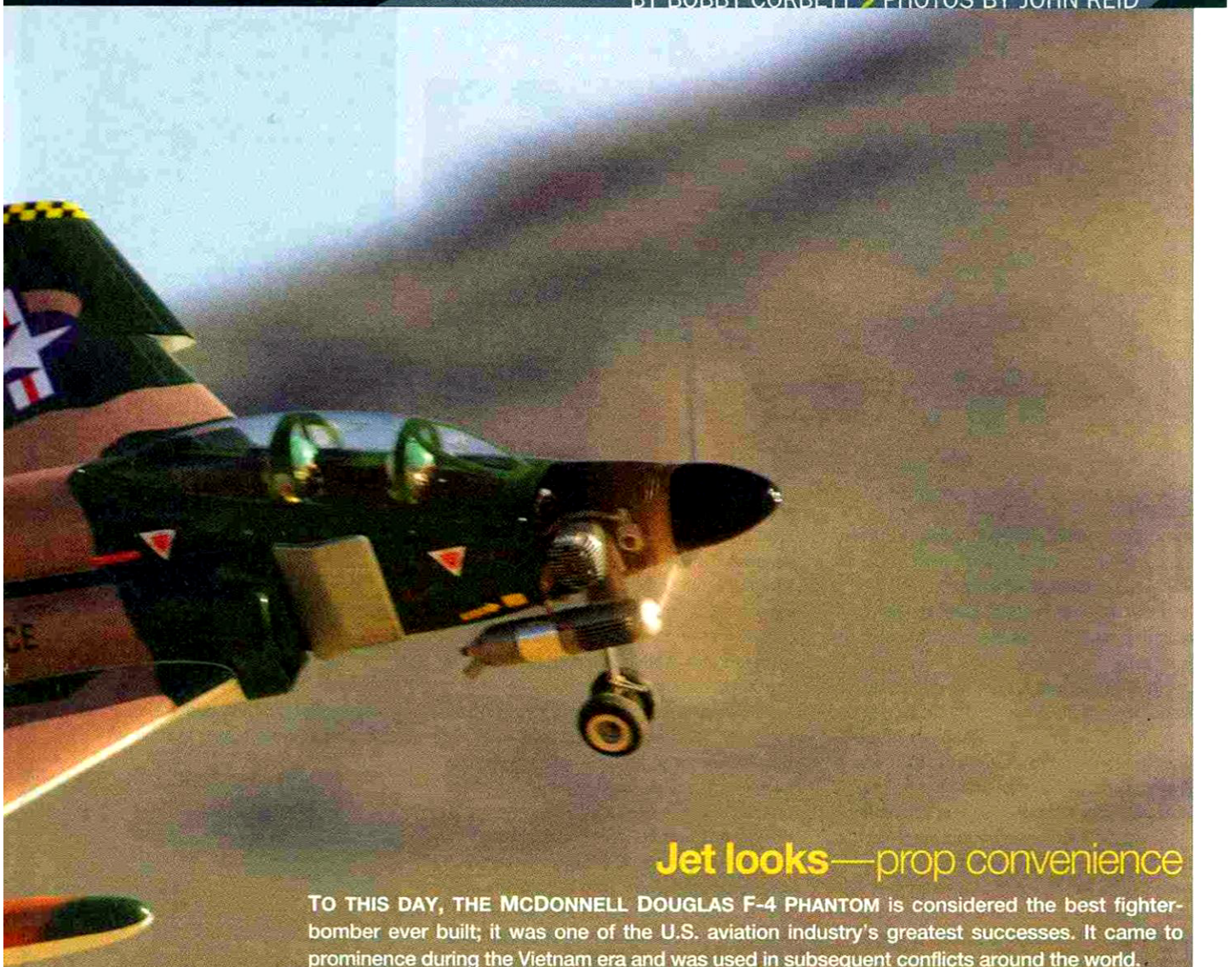
*See the Source Guide on page 151 for manufacturers' contact information.*




> "At low rates, ITS HANDLING IS EXTREMELY SOLID; at high rates, it is agile and quick."

# VMAR F-4 PHAN

BY BOBBY CORBETT > PHOTOS BY JOHN REID



## **Jet looks**—prop convenience

**TO THIS DAY, THE MCDONNELL DOUGLAS F-4 PHANTOM** is considered the best fighter-bomber ever built; it was one of the U.S. aviation industry's greatest successes. It came to prominence during the Vietnam era and was used in subsequent conflicts around the world.

This top-quality F4 Phantom II ARF from VMAR by Richmond RC is one of the best sport-jet replicas of the F4 Phantom available. The revolutionary new VCOTE 2-3DS covering has details such as panel lines, rivets, letters and markings fused into it.

The VMAR F4 Phantom II ARF comes in two versions: U.S. Navy and U.S. Air Force. The model's parts are neatly packaged between strips of paper with the main components sealed in plastic bags. The fuselage and the wings are all-wood, built-up construction and include hinged and pinned control surfaces. Everything is covered with VCOTE 2-3DS covering, so all of the finish details have been done for you—no decals! A metal spinner, detailed pilot figure and pre-painted cockpit are provided. Also included are a fuel tank and a complete hardware package. A prebent, semi-scale nose gear, main struts, wheels, a set of dummy fuel tanks and landing-gear cavity covers (in case you choose not to install the optional mechanical retracts) round out the package. A 15-page manual that's chock-full of color photos guides you through the assembly of this great-looking ARF.

# FOM II


## SPECIFICATIONS

**MODEL:** F4 Phantom II
**MANUFACTURER:** VMAR
**DISTRIBUTOR:** Richmond RC
**TYPE:** semi-scale prop-jet
**LENGTH:** 63 in.
**WINGSPAN:** 58.5 in.
**WING AREA:** 910 sq in.
**WEIGHT:** 10.25 lb.
**WING LOADING:** 26 oz./sq. ft.
**ENGINE REQ'D:** .60 to .91 2-stroke
**RADIO REQ'D:** 4-channel w/6 servos (7 servos if optional retracts installed)
**PRICE:** $299.95

## COMMENTS

The F4 Phantom II is finished with "Polycote ECS" that includes Sure-Seal—a process that makes the covering extra durable.

## HIGHLIGHTS

- Unbeatable build quality
- Fast assembly
- Spectacular performance

### ASSEMBLY

It's always a good idea to lay everything out first, just to see whether any pieces are missing before you begin construction. You don't want to get halfway through the construction and then discover that something is missing.

The F4 Phantom II requires minimum assembly to make it airworthy. In fact, it takes longer to install the radio gear than it does to assemble the plane! The main components are the fuselage, the plug-in, prehinged wings, the tail stabs and the rudder.

I began construction by joining the wing halves to the fuselage. Note that in some parts of the world, some of the construction steps outlined in the manual may have been completed at the factory, so don't be surprised if you go to install something and find that it has already been done.

I started by inserting two aluminum tubes into the predrilled fuselage holes. The longer (26¾-inch) tube goes in the front hole; the 19¾-inch one goes in the rear hole. Now I was ready to plug the wings into the fuselage. They are held in place with butterfly wing nuts.

Next, I installed the aileron servos in the servo bay inside the wings. With a hobby knife, I removed the covering from the servo bay, and then I made certain that the servo output shafts were facing the rear of the wing. I attached the aileron control rod and horn with the hardware provided for each wing half. I then inserted straight pins through the wing to hold the ailerons in place while I measured for the correct length of the pushrods. Once I had cut the pushrods to the correct length, I connected the linkage to the ailerons.

### FUSELAGE CONSTRUCTION

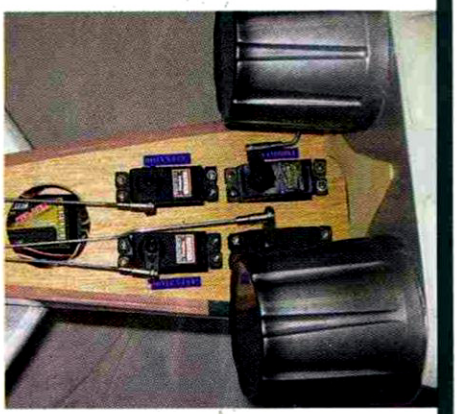
To begin assembling the fuselage, I first test-fit the vertical and horizontal stabilizers. I used 30-minute epoxy to attach these components to the fuselage. Because the elevator and rudder are prehinged, I had to be careful not to get any excess epoxy around the control rods, the hinge lines and especially the rudder pushrod that is near the vertical fin at the top of the fuselage.

The main landing gear is mounted on a plate on the underside of the wing; it's held in place with four Phillips-head screws. The nose-gear bearing assembly comes mounted on the firewall. I used a little thread-lock on the steering arm and the EZ connector setscrews to prevent them from loosening. I inserted the nose gear into the bearing and the steering arm, and then I connected the pushrod to the EZ connector and tightened both of the setscrews. All of the wheels come mounted on the gears, but I still double-checked the wheel-collar setscrews just to make sure that everything was tight.

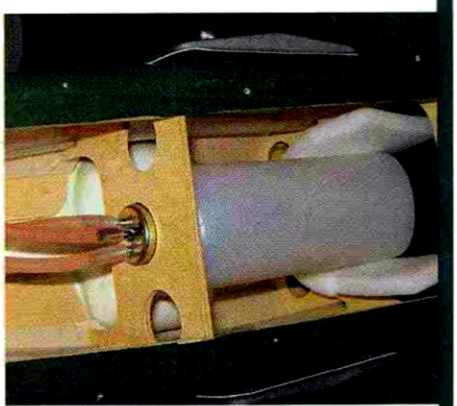
I assembled the fuel tank with three lines: fuel feed, pressure and refueling. Before you install the fuel tank, you must remove the seven small screws that hold the cockpit instrument panel to the top of the fuselage. I used foam to cradle the fuel tank in position so it would not move around in the fuselage. Then I ran the fuel lines through the predrilled firewall and reinstalled the cockpit and canopy.

### ENGINE MOUNTING

Because the VMAR F4 Phantom II was designed to accommodate a .60 to .91 2-stroke engine, I chose the O.S. .91FX; it's at the upper end of the recommended range and provides plenty of power. The engine mount comes installed, and I was able to place the engine in the compartment without making any modifications. I positioned the engine so that I had a 3/32-inch gap between the spinner's backplate and the front of the fuselage. I marked the location of the holes, drilled a 3/32-inch pilot hole and then installed the motor on its mount using four no. 25



**The aileron servos are mounted on the wing's underside. The short pushrod from the servo to the control surface ensures a solid control connection.**



**The canopy hides the access hatch to the equipment bay. As you can see, there's plenty of space.**


## IN THE AIR

### IN THE AIR

For the VMAR F4 Phantom, I used a powerful engine, prop and fuel combination; coupled with a weight of just 10.25 pounds, this produced a very fast jet. Because of the speed and the camouflage cover, it's good to have 20/20 vision here. Make sure that you keep your eye on it!

### CONTROL THROWS

**Elevator:** ±⅓ in. (low); ±½ in. (high); expo 40%
**Ailerons:** ±⅓ in. (low); ±½ in. (high); expo 20%
**Rudder:** ±⅝ in.

### GENERAL FLIGHT CHARACTERISTICS:

**Stability:** I didn't expect this much performance from a sport jet. At low rates, its handling is extremely solid; at high rates, it is agile and quick.

**Tracking:** the aircraft has good ground handling; just a little right rudder was needed on takeoffs. Once in the air, it goes exactly where you point it.

**Aerobatics:** this is not an aerobatic model, but it can duplicate the fundamental scale maneuvers that full-size jets perform.

**Glide performance:** set the Phantom II's CG at the recommended location (10 7/16 inches from the leading edge), and deadstick landings are surprisingly stable without any tendency to snap-roll!

**Stalls:** you wouldn't expect stability to be inherent in a semi-scale jet, but the Phantom II flies like most 60-size sport planes! Landings are quite conventional.

### PILOT DEBRIEFING

I was pleasantly surprised to discover that after an engine flameout, a deadstick landing was really easy. I didn't expect the F4 Phantom II to stay aloft very long without power. When the motor quit at 400 feet, I set up my landing approach and kept the nose slightly up. I headed into the wind and pointed the plane right down the middle of the runway. It came in for a perfect landing on the mains, followed by the nosewheel touching down smoothly. Basic aerobatic maneuvers such as stalls, high- and slow-speed turns are all possible with this plane. Flying inverted required very little down-elevator to keep it level. It also demonstrated minimal signs of the roll and pitch coupling that are associated with this type of aircraft. This is truly a rugged and remarkable flying model.

sheet-metal screws. The throttle control rod was already installed; all I had to do was connect the linkage to the servo and throttle arm on the carburetor. The custom-made aluminum spinner comes complete with all of the hardware you'll need. I did find that the spinner's retaining screw was about ¼ inch too long for the O.S. crankshaft. This extra length wouldn't allow the backplate to seat with the spinner. I solved the problem by grinding off a bit of the brass coupler that lies between the backplate and the spinner's retaining screw with a Dremel tool. The shortened coupler allowed a nice, snug fit between the spinner and the backplate.

## GEAR USED

**RADIO:** Futaba T7CAP with a Hitec HFD-08RD receiver and Futaba S3151 standard digital servos (6)

**ENGINE:** OS .91FX 2-stroke

**FUEL:** PowerMaster 15%

**PROP:** Top Flite Power Point 14x8

### FINAL ASSEMBLY

I installed 4 servos in the servo bays at the rear of the fuselage. After attaching the control horns to the rudder and elevators, I used two, 9½-inch pushrods to connect each elevator to a servo.

Next, install the rudder control horn, and hook up the linkage from the rudder to the appropriate servo (their locations are clearly marked in the instructions). The pushrod for the nose-gear steering is hooked up to the opposite side of the rudder control arm. I wrapped the receiver and battery pack in foam and then mounted them in the rear bay of the fuselage along with the servos. After I had installed most of the airborne system in the rear of the fuselage, I found that I still needed to add 8 ounces of weight there to balance at the correct CG.

I installed the plastic landing-gear-cavity covers because I did not use retracts on the plane; thin CA is all you'll need to glue them. Using the supplied screws, I then installed the dummy fuel tanks under the wings at the recommended locations. Because I used a servo for each aileron, I decided to program in a flaperon mix. I confirmed all of the control-surface throws and directions and rechecked the balance one last time. Everything was ready for the flying field!

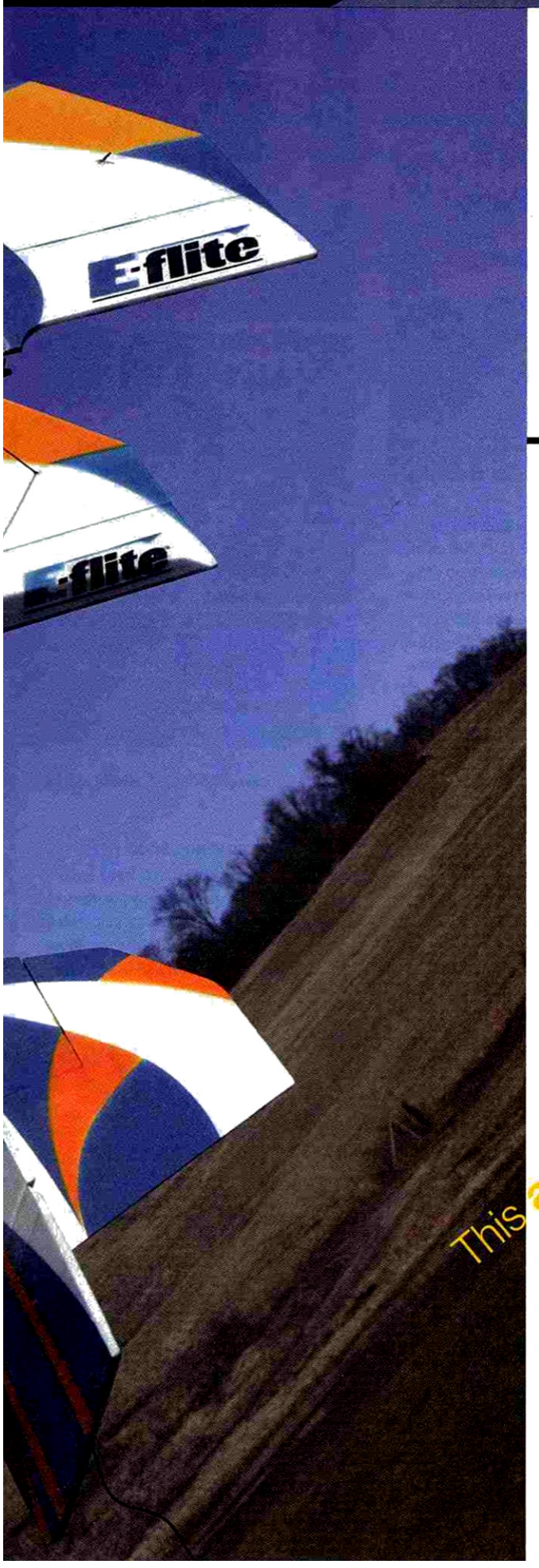
### CONCLUSION

This is a rugged and well-built ARF. Best of all, the Phantom II's flight envelope is exceptionally good. Its solid performance in the air is sure to put a grin on any pilot's face. If you want a great-looking plane that's easy to build and fly, the VMAR F4 Phantom II should be on your list. ✚

*See the Source Guide on page 151 for manufacturers' contact information.*


**"... I've never before flown a model in which** EACH AXIS WAS SO INDEPENDENT**"**

BY CRAIG TRACHTEN > PHOTOS BY PETE HALL

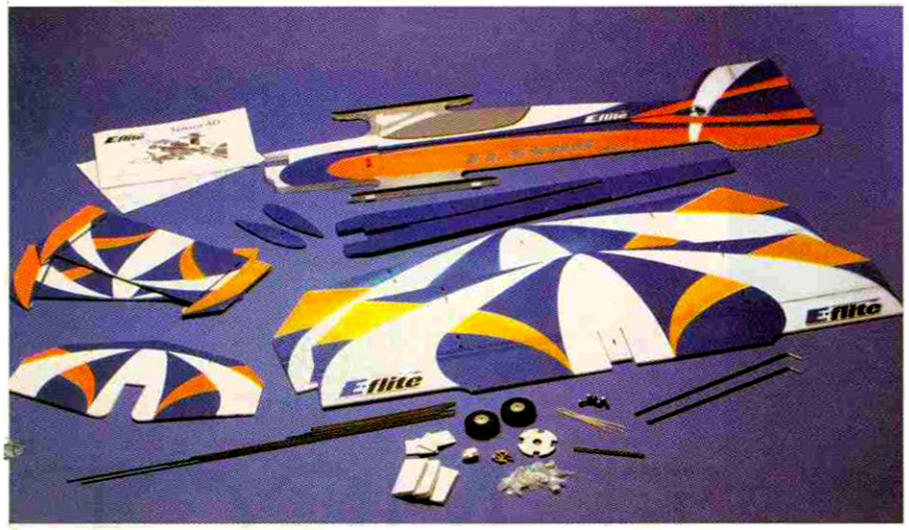



## E-FLITE

# TENSOR 4D

This **aerobatic electric biplane** is a winner!

**DO YOU REMEMBER WHAT YOU THOUGHT** when you saw your first foamie? Was it something like, "Can't use those foam trays to pack burgers anymore, so let's see if they will fly!" To quote an old TV commercial, "You've come a long way, baby," and that is today's world of foamies. The Tensor 4D is the latest of Horizon Hobby's E-flite line, and if you haven't experienced one yet, you're really missing out on some great fun! The Tensor 4D raises the bar for foamie flying with its documentation, durability and flight characteristics. Let's take a closer look.



## SPECIFICATIONS

**MODEL:** Tensor 4D
**MANUFACTURER:** E-flite
**DISTRIBUTED BY:** Horizon Hobby Inc.
**TYPE:** electric, 3D biplane
**WINGSPAN:** 27 in.
**WING AREA:** 393 sq. in.
**WEIGHT:** 11.82 oz.
**WING LOADING:** 4.33 oz./sq. ft.
**LENGTH:** 30 in.
**MOTOR REQ'D:** outrunner
**RADIO REQ'D:** 4-channel (rudder, aileron, throttle, elevator)
**PRICE:** $54.99

## COMMENTS

The Tensor 4D's documentation is superior, especially the construction photos, the hardware supplied and the flight performance. Flying the Tensor is different because of its side-force generators, so schedule your first test flight as a reasonably docile "let's see how it flies" session before you try to twist the wings off this bird.

## HIGHLIGHTS

- Great instruction manual
- Impressive durability
- Wild flight performance

### WHAT'S IN THE BOX?

Besides seven pieces of brightly decorated foam, a complete hardware package is supplied right down to the nylon string needed to fabricate the pushrods. All the control horns, clevises, keepers and carbon-fiber supports are there.

Don't panic when you see a 48-page assembly manual. The Tensor isn't a labor-intensive build; most steps are only two or three sentences long. The manual is thick because of the many large construction photos. One picture is worth a thousand words, and you could almost build the Tensor without reading a sentence.

### ASSEMBLY

With the aid of Bob Smith Industries (BSI) Super Gold+ and Insta-Set accelerator (both foam-safe), I was able to build the Tensor in a single afternoon.

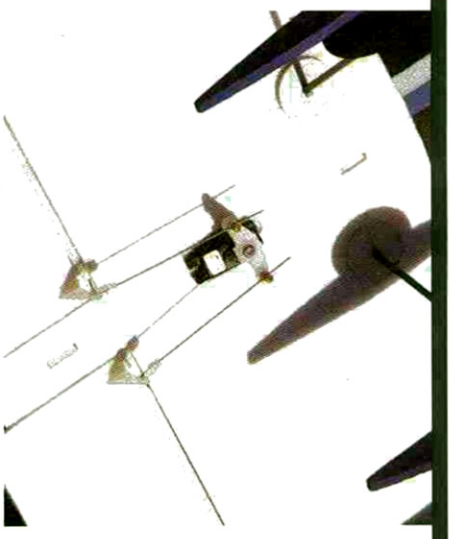
There is a construction addendum supplied, so read it before you start. The entire fuselage and tail-surface construction consists of assembling five pieces. The elevator is factory-attached, as are the rudder and ailerons; at last, I have taped hinges without my fingerprints in them! Slide the horizontal fuselage into the vertical section, but do not glue it yet. After you've attached the elevator joiner, you'll have to slide it into the vertical fuselage. Move the horizontal fuselage section and stab into place using the alignment notches to guide you. Before going crazy with the glue, tack a few strategic points along the fuselage joint; then check the alignment. If it is off, it will be easier to break loose a few tack-glue joints than to undo a full seam. When you are satisfied with the fuselage alignment, glue all seams with CA and kicker. Spritz in some accelerator, wipe it down with a paper towel, and your fuselage and tail feathers will be finished.

### SERVOS AND CONTROL RODS

The radio gear and pushrods have to be installed before you attach the wings to the fuselage. The control horns can be attached in two ways. One way will give you more control-surface deflection, so ask yourself "How good am I?" before you install them.

**The E-flite Park 370 outrunner has a lot of power.**

**Setting up the tail feathers is uncomplicated.**



**I used a single servo to control the ailerons. If you wish, you can use dual servos.**

## IN THE AIR

I was able to secure the Sports Domain in Winsted, CT, for the Tensor's first flights. This indoor facility is the length of two soccer fields with a height of about 65 feet. It's a great place to fly indoor 3D! Since then, I have made several flights outdoors in light air, and the Tensor has proven to be very capable.

### CONTROL THROWS

**Ailerons:** ±1 3/8 in., 50% expo (high); 3/4 in., 20% expo (low)
**Elevator:** 1 7/8 in., 55% expo (high); 1 in., 25% expo (low)
**Rudder:** 2 in., 30% expo

### GENERAL FLIGHT CHARACTERISTICS

- **Stability:** this is a model that is neutrally stable in all axes. I've never before flown a model in which each axis was so independent, as there really was no interaction between roll, pitch and yaw. It's definitely something that you need to get used to before you can fully wring out the Tensor.
- **Control response:** with its slower flying speed, the Tensor uses large control throws for maximum maneuverability. Be sure to use some expo to soften the control response around neutral.
- **Aerobatics:** performing aerobatics with the Tensor is a real hoot. One thing that I did notice was that maneuvers beyond basic loops and rolls required more concentrated effort to move the sticks.
- **Glide performance:** like all biplanes, the Tensor is somewhat draggy when the power is reduced. Keep some power on so that there's a bit of airflow over the control surfaces during landings.
- **Stalls:** when the Tensor stalls, it's very anticlimactic. Depending on its attitude, it will drop a wingtip or its nose.

### PILOT DEBRIEFING

To get a feel for the model, your first flights should be mild; stick to basic aerobatics. You'll find the model gentle and stable, especially on low rates. Its unique shape while in flight takes a little getting used to, but you'll soon grow accustomed to it.

As mentioned, performing maneuvers take some getting used to, and I attribute this to the independent axes' control of the model; but once you get this figured out, you'll have a great time. It's really neat how you can place the Tensor in any attitude and keep it there with so little effort. I really enjoyed the model's ability to fly inverted or in knife-edge as if it were still upright. With its fast pitch-and-yaw rate, the Tensor is a great flyer indoors or in a tight outdoor space, such as a schoolyard.


I installed them for full deflection and then used my computer radio to dial in the rates I wanted.

Mark and cut out the openings in the fuselage for the elevator and rudder servos. I find the easiest and cleanest way to do this is to start with a sharp no. 11 hobby blade and "poke" the outline of the servo into the foam. Continue to poke it a little deeper until you've connected the dots, and the center falls out. I glued my servos into place and then constructed and installed the pushrods as shown in the manual. The aileron servo will be installed later.

### WINGS

Here is where you can make or break a great flyer. Take your time, and make sure that the wings are installed square with the fuselage and the side-force generators (interplane struts). I used heavy, steel squares to check the wings' alignment. Here again, it is a good idea to tack-glue, check for squareness and then glue the seams. Install and glue the carbon-fiber rigging rods, and check their alignment every step of the way. Now the aileron servo can be installed. Follow the manual's photos to build and install the aileron pushrods and slave rods (these connect the lower ailerons to the upper ones).

It is worth noting that although I installed a single aileron servo, you can use two individual servos to give you more setup options.

### FINAL ASSEMBLY

After the wings and fuselage were assembled, I installed the recommended EFLM1200 Park 370 outrunner motor using the plywood motor mount supplied in the kit. Use double-sided foam tape to secure the ESC and receiver in the underside of the fuselage. Attach the landing gear and wheel pants. Use glue generously to secure the carbon-fiber landing-gear rods. A friend suggested that a thin, lite-ply plate in the fuselage's gear slot would make a strong attachment for the gear. Construction is finished by gluing the lower and upper wing fences into place. All that's left to do now is to check the center of gravity (CG) and to slide your battery back and forth in its slot to achieve a proper balance. The CG range is only 1/4 inch, so check it carefully.

### IN CONCLUSION

What a rush! After I flew the Tensor 4D at a local sports dome, I came away with a new desire to sharpen my piloting skills. This model will do anything you ask of it, and it will teach you a few tricks along the way. If you want some wild and crazy flight performance, this is your ticket to ride!

*See the Source Guide on page 151 for manufacturers' contact information.*

### GEAR USED

**RADIO:** JR XP9303
**RECEIVER:** JR R610M
**SERVOS:** 3 JR NES 241 microservos
**PROP:** APC 10x3.8 Slow Flyer
**MOTOR:** E-flite Park 370 outrunner
**BATTERY:** Thunder Power 3-cell, 1320mAh Li-poly

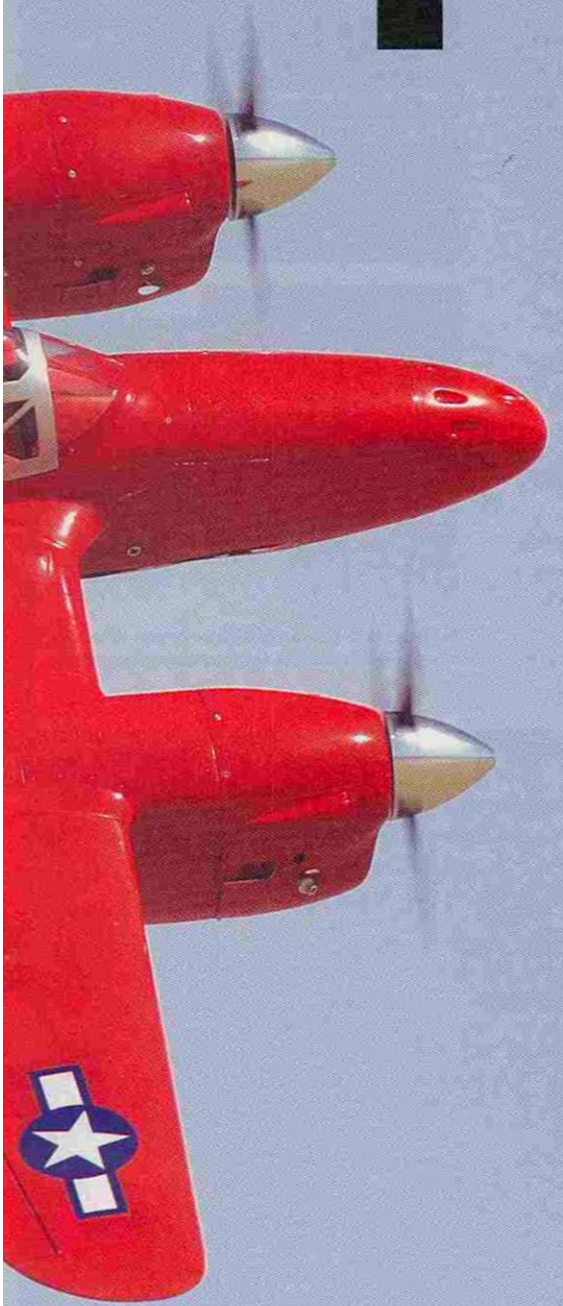

**"Its detailed scale looks and solid flight performance MAKE IT A MUST-HAVE"**

BY SCOTT HAMPTON > PHOTOS BY JOHN REID

## KONDOR MODEL PRODUCTS

# P-38J

### The beautiful forktailed devil



**TO CELEBRATE THE PRODUCTION OF 5,000 P-38 LIGHTNINGS,** Lockheed painted the 5,000th P-38J fire-engine red. This plane also had "Yippee" painted on the undersides of its wings in big white letters. In it, Lockheed test pilots Milo Burcham and Tony Levier made some remarkable flight demonstrations. To show that the P-38 was not the unmanageable beast it was rumored to be, they flew slow rolls at treetop level with one prop feathered. Their exploits did much to quell the fears of pilots who viewed the P-38 as a handful to fly. This beautiful demonstration plane has been nicely reproduced by Kondor Model Products with its P-38J Yippee ARF, which is available in three color schemes. Let's take a look at it.

## SPECIFICATIONS

**MODEL:** P-38J Lightning
**DISTRIBUTOR:** Kondor Model Products
**TYPE:** scale ARF
**LENGTH:** 60 in.
**WINGSPAN:** 86 in.
**WING AREA:** 865 sq. in.
**WEIGHT:** 16.5 lb.
**WING LOADING:** 44 oz./sq. ft.
**ENGINES REQ'D:** 2, .40 to .46 2-strokes or .52 4-strokes
**RADIO REQ'D:** 7-channel with 13 servos (2 aileron, 1 elevator, 2 rudder, 2 throttle, 4 flaps, 1 retracts, 1 steering
**PRICE:** $550

## COMMENTS

The plane is a quick build, and the parts fit well.

## HIGHLIGHTS

- Great looks
- Included air retracts
- Comprehensive hardware package

**THE KIT**

The inboard wings, tail booms and cockpit are all made of fiberglass, and the outer wing panels, the rudders and the stabilizer are made of wood and covered with red heat-shrink covering. The comprehensive hardware package even includes a full air-retract landing-gear kit with a steerable nosewheel.

**Wing assembly** As I usually do with an ARF, I began with the wings: I attached the flaps and installed the flap servos in the servo trays. The inboard wings both have flaps that require hinging, but my Yippee did not have any precut hinge slots. I used the supplied Robart hinge points for the flaps. To make cleaner holes for them and because the wings and flaps are made of fiberglass, I drilled three small holes inboard on each wing and on the flaps. You need a gap between the bottom of each wing and the top of each flap for the control-horn backing plate to clear.

Now it's time to mount the inboard wings on the center pod and tail booms. An aluminum tube runs through all the components and is epoxied into place.

I worked on the outer wing panels next. I hinged the ailerons using the supplied CA hinges, and then I attached the aileron servos to the servo trays and installed them in the wing. I mounted the control horns, installed the servo linkage and tested it.

**Fuselage** At this point, you assemble the two booms, the cockpit and the inboard wings. You will need a big work area, so clear everything off your workbench!

The retracts were a snap to put in; all the hook-ups needed for installation are provided, and the instructions tell you how to install them.

Before you install the two supplied fuel tank, you need to know which engines you'll use so that you can route the throttle linkage next to the fuel tanks to suit them. I cut 10, 2x2-inch squares of foam for each tank, pushed the tanks into place and installed a dowel above and below them to secure them. You may find this assembly

**Each retract has a fiberglass cover. After the retracts were installed, I cut out the exit openings.**

## 4-STROKE ENGINE RCV 91-CD ENGINE

**FOR THE YIPPEE, I WANTED TO TRY SOMETHING** new (to me), so I chose the revolutionary RCV 91-CD 4-stroke engine. This engine offers power and performance in a small package and has fewer moving parts than conventional 4-strokes; in fact, it has only one more part than a conventional 2-stroke.

The cylinder in the RCV 91-CD rotates around the piston because it's suspended between two bearings that allow it to rotate. A gear at the back of the crank meshes with a gear at the base of the cylinder. When the piston moves up and down in the cylinder, it turns the crankshaft that, in turn, rotates the cylinder around the piston.

At the top of the cylinder is a port that rotates and comes into alignment with three radially arranged ports—the inlet, ignition and exhaust ports. This simple valve arrangement allows the RCV 91-CD to cycle through a conventional 4-stroke progression: induction, compression, power and exhaust.

I ran both engines for an hour to break them in, and I noticed that the longer they ran, the less fuel they consumed. By the time I had finished break-in, they responded from 2,400rpm to 6,000rpm without hesitation when I opened the throttle quickly. I was impressed by the low vibration and how smoothly the RCV engines ran on the bench. After I had installed them on the P-38, I found out just how great this engine really is. Both engines had a reliable idle (very important for a twin) and a smooth transition to full throttle. They provided plenty of power, and I was easily able to perform all of the maneuvers that the full-size P-38 could do. This innovative engine is definitely worth considering for your next .91-size project.

## IN THE AIR

My P-38 Yippee was balanced to the manufacturer's recommendations, as were all the control throws. Each RCV 91-CD 4-stroke has a Master Airscrew 12x6, 3-blade prop, and I broke in both for about an hour. I connected a custom-made glow-plug igniter to both engines so that I'd be guaranteed a reliable idle. The model's first few flights were on days on which a 6- to 7mph wind blew straight down the runway.

**CONTROL THROWS**

**Elevator:** ±¾ in. (high); ±½ in. (low); expo: 0%
**Aileron:** ±¾ in. (high); ±½in. (low); expo: 0%
**Rudder:** ±1¼ in. (low); expo: 0%
**Flaps:** -⅝; flaps were set up on dial control

**GENERAL FLIGHT CHARACTERISTICS**

**Stability:** this plane is very stable at low and high speeds.
**Tracking:** on the ground and in the air, its tracking is outstanding.
**Aerobatics:** the P-38 Yippee will do all the maneuvers that the full-size plane does.
**Glide performance:** because of its high wing loading, I did not attempt any deadstick landings. The glide performance at low throttle was very good, though.
**Stalls:** when it stalls, the P-38 drops a wing, but its recovery is very fast once the nose is pointing downward.

**PILOT DEBRIEFING**

The P-38 Yippee serves up an excellent flight performance that any pilot will appreciate; it offers stable, slow flight and solid, precise high-speed flight. Adding exponential to soften the center stick improves straight and level flight, especially when flying with high rates. I had to add ¼ inch of downtrim; when you assemble the P-38, I recommend that you adjust the stabilizer's incidence so that your plane won't need as much down-trim. The roll rate greatly improves when rolls are flown with high rates. On low rates, the roll takes a long time and requires the help of the rudder; on high rates, they are fast.

easier if you wait to attach the booms to the inner wings at this point rather than when specified in the instructions. Why? It's much easier to work with the individual booms than with the completed fuselage.

I installed the stabilizer by removing the covering from where it fits into the slots at the end of the booms. I applied 30-minute epoxy to the bare wood, slid the stabilizer into place and, after checking its alignment with the rear of the wing, I set the assembly aside to dry.

I centered the rudder pushrods in each boom and cut slots where they exit in line with the rudder control horn. Next, I hinged the rudders into place, and I ran into a slight problem: there weren't any hardwood blocks in the vertical stabilizers on which to mount the rudder hinges. I cut two ⅜x⅜-inch hardwood blocks, drilled a hole in the center of each, put each block into place with the pin hinges, and the rudders went on easily.

The outer wings are not glued into place but can be removed for ease of transportation. I glued two alignment dowels into each outer wing root—one at the front and the other near the rear. These dowels guarantee that the wing will always be correctly aligned when it's attached to the fuselage. The wings are held in place by a hook and a rubber band inside each boom.

I routed four sets of servo extensions (ailerons, flaps, throttle and rudder) through each boom and the inner part of each wing to the receiver, which is in the cockpit. After installing all the servo extensions in the cockpit, I installed the elevator servo there. The elevator is controlled by a pull-pull system that exits at the rear of the cockpit and extends to the elevator control horns.

It was then time to bolt the two engines to their mounts. Be sure that the engines are installed so that there are 4¾ inches between the back of the prop and the firewall. I test-fit the cowls, cut out the exhaust ports and mounted the cowls on the firewalls. I finished the fuselage by installing the servo that operates the nosewheel steering; this is also a pull-pull system.

**Final assembly** The canopy is held by four small screws. I screwed the fiberglass hatch covers to the underside of each boom. The third hatch cover goes on the main fuselage. Make a cutout for the nosewheel before you attach it to the fuselage. With everything checked and balanced, my fork-tailed devil was ready for the flying field.

**FINAL THOUGHTS**

As I gazed with pride at my new P-38J Lightning, I knew that the assembly work had been well worth the payoff. Its detailed scale looks and solid flight performance make it a must-have. Kondor Model Products really put a lot of effort into producing this ARF. ✈

*See the Source Guide on page 151 for manufacturers' contact information.*

## GEAR USED

**RADIO:** Airtronics RD8000 transmitter and receiver, 13 Airtronics 94102Z standard servos

**ENGINES:** RCV 91-CD 4-strokes (2)

**FUEL:** Wildcat 15%

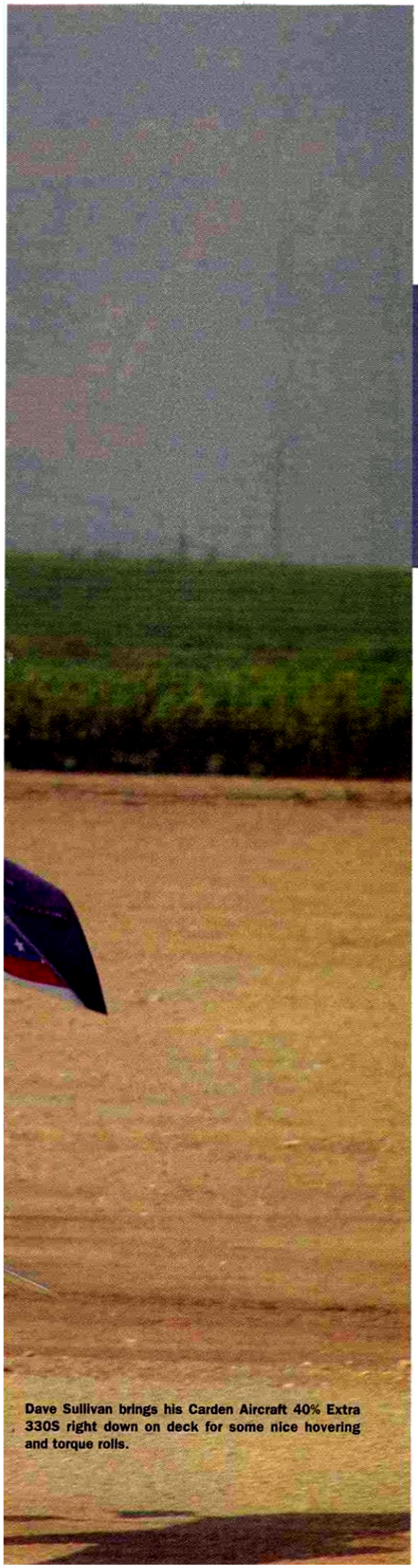
**PROP:** Master Airscrew 12x6 3-blade

PLUS

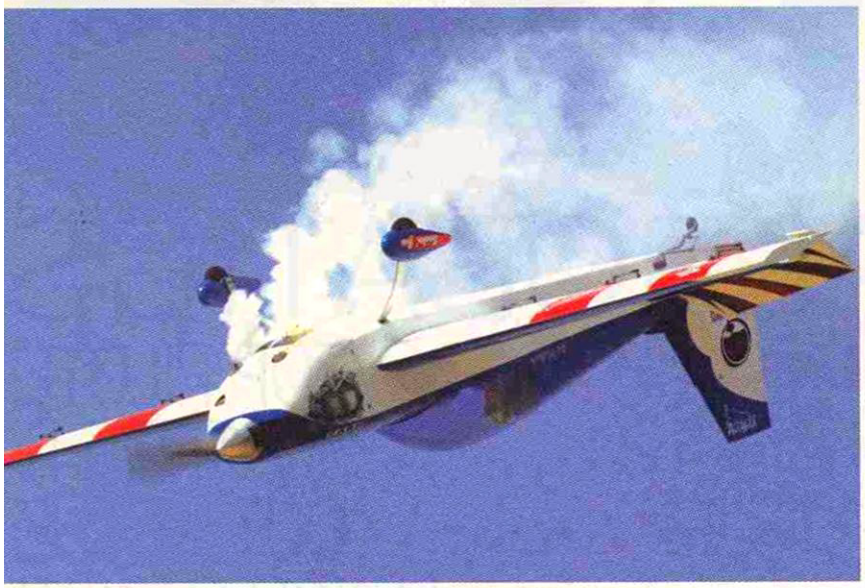
# OUTRAGEOUS AEROBATICS

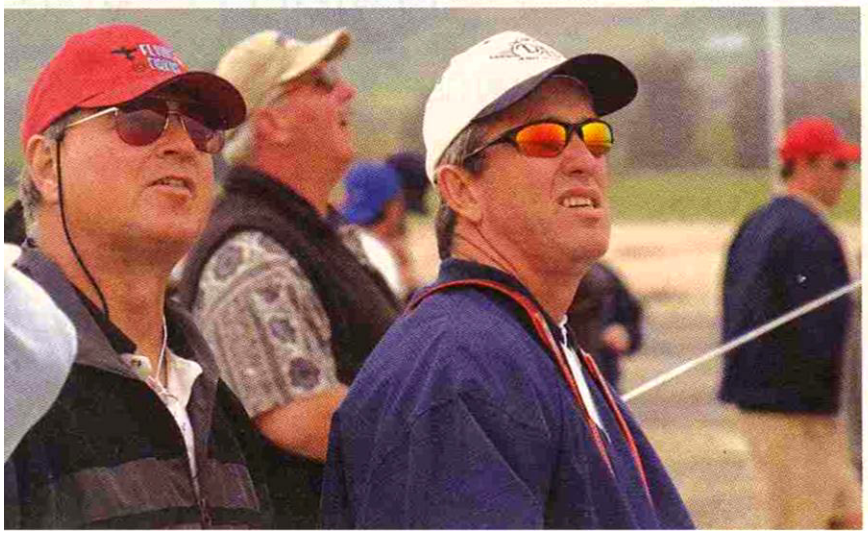
## TOP PILOTS BATTLE IT OUT AT THE FLYING CIRKUS

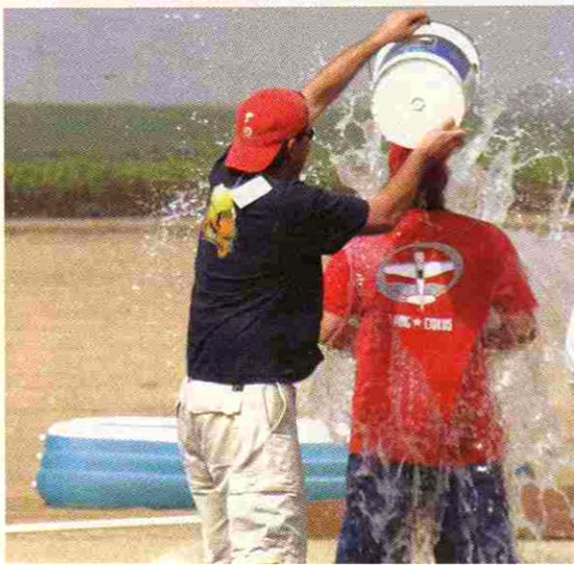
**BY** JOHN REID **PHOTOS BY** JOHN REID

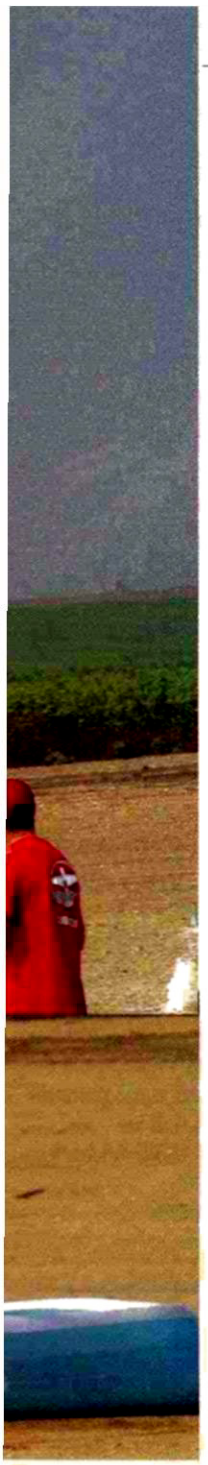


**Dave Sullivan brings his Carden Aircraft 40% Extra 330S right down on deck for some nice hovering and torque rolls.**









**IF YOU'VE EVER WONDERED** how powerful the Internet is, the Flying Cirkus is the perfect example of what can be accomplished by a single website. It began as a way for a few guys, "Mad Max" Duncan, Jason "Showtime" Saulten and "Smokin' Joe" McBride, to express their love of extreme 3D flying. This cyberspace venue is now a meeting place where thousands around the country share their enthusiasm for 3D. After three years of growth and development, it was time for the Flying Cirkus to move out beyond its cyberworld and put on an event unlike any other. Working with the good folks at Pomona Valley Model Airplane Club, the Flying Cirkus crew decided to stage RC's first 3D-only event.

During the weekend of March 12 to 13, 2005, 63 pilots and more than 1,000 members and guests traveled from all over the country to Prado Dam, CA, for this first-time Fly-in. In the event of an "Aunt Jemima" (see the "Flying Cirkus lingo" sidebar) on the runway, PVMAC members Gary Cummings, Jim Caspio and David Gray manned the "Whambulance" during the weekend.

**Clockwise from top left: Smokin' Joe McBride and Mark Leseberg get in close as they both do some formation hovering. • Jason "Showtime" Saulten brings his behemoth Pitts Special down on the deck for some nice hovering. • Completing the tail dip, Mark Leseberg pulls his Composite ARF Extra 330L out of the pool and up for the next maneuver. • Payback is sweet! Read the article to learn why Mad Max decided to exact his revenge on "Showtime" Saulten during his noontime performance. • Dan Gayheart (right) spots for Mark Trent during his flight. All pilots were required to have a spotter along during every flight. • Why is Joe McBride's nickname "Smokin'"? Here's the answer!**

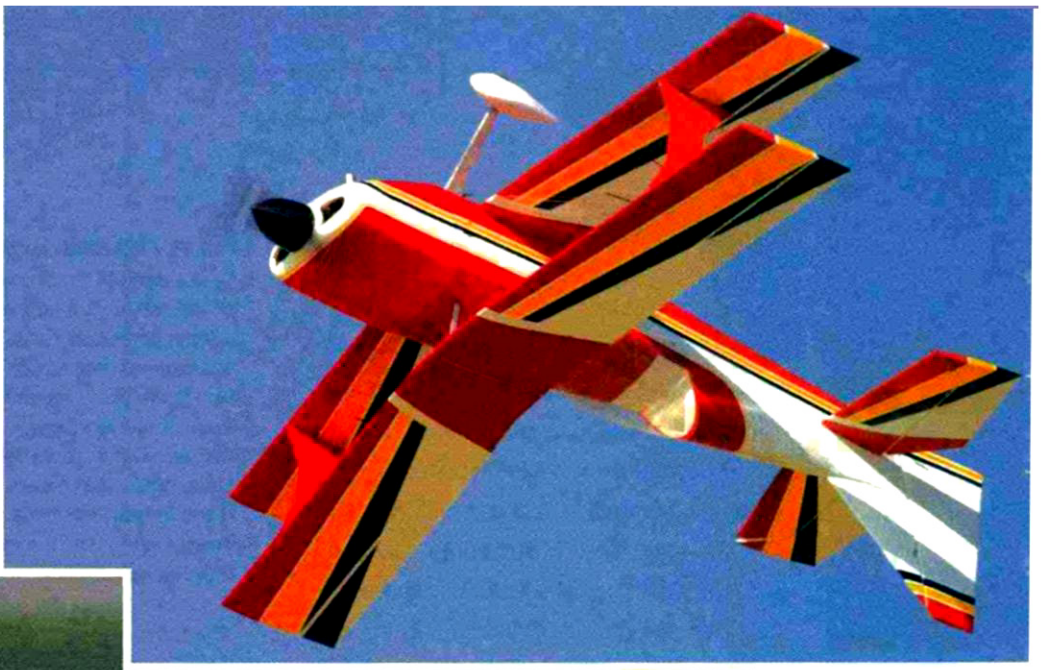
**THE FLYING CIRKUS GROUP SOLICITED THE HELP OF BOB** "The Mouth of the South" Sadler to take on the responsibility of contest director and announcer. They could not have chosen a better person for the jobs. Bob was on top of things throughout the weekend, and he made sure that everything flowed smoothly. Safety was at the top of the list throughout the event, and Bob saw to it that everyone kept the planes out past the safety lines. There wasn't a single safety issue during the Fly-In, and the Whambulance was needed for only one airplane crash. Bob stayed on the microphone the entire weekend to provide up-to-date information for the participants, maintain order on the flightline and enlighten the crowd with his pearls of wisdom. It was the first event that I've ever attended where I heard the announcer say such things as, "Hey, boys, we huckin' it yet?" and "That is sexier than socks on a rooster!"

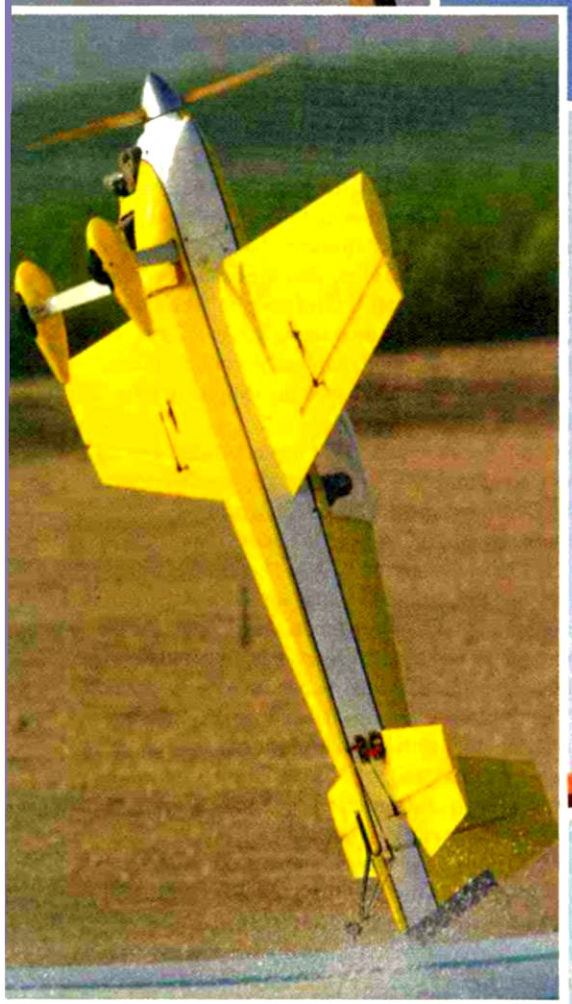
On Saturday morning, pilots enjoyed open flying until the noontime demo and throw down. The morning skies were filled with a wide variety of aerobatic aircraft that ranged from micro electrics, .40-size glow power all the way to 40-percent gassers. Every pilot had a chance to enjoy plenty of flying time during the morning hours and later, after the obstacle-course competition. The fog burned off around noon to give the attendees a nice, clear (albeit windy) afternoon. And even after the sun went down, the flying action didn't stop; club members brought in powerful lights that allowed the foamies to fly well into the night.

The noon demonstration and throw down featured, among others, pilots Garrett Morrison, Mark Leseberg, Joe McBride and Jason Saulten. Their outstanding 3D performances kept the crowd totally entertained, but that wasn't enough for the Flying Cirkus crew. Earlier in the day, while Max Duncan was being interviewed by Bob Sadler, Jason Saulten approached them from behind and dumped a bucket of water on Max. "Mad Max" waited for the noon demo to take his revenge. In the middle of Jason's flying demonstration, while he had his 41% 3W Monster Pitts hovering on the deck, the crowd could see that Max was sneaking up behind him with a bucket of water. Max dumped the water on Jason's head, and the Monster Pitts rocketed skyward as Jason turned around and started yelling at Max. A wrestling match ensued, and the transmitter flew into the air and then shattered into small pieces when it crashed down on the runway. The crowd gasped, but they noticed that the Pitts was still performing aerobatic maneuvers! At the end of the flightline, Joe McBride stepped out onto the runway and waved at the crowd with the real Monster Pitts transmitter in his hands. Jason smiled while acknowledging the crowd, then took the transmitter from Joe and continued his demonstration.

**THE 3D OBSTACLE COURSE**

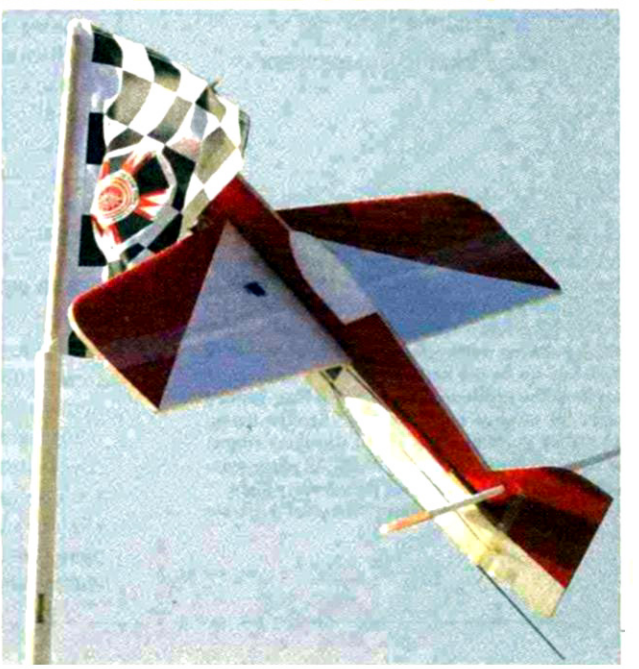
This obstacle course was the part of the event that 3D fliers wanted to see but were hesitant to sign up for. While the ground crew set up the main obstacle course, Bob Sadler got the foamie obstacle course started. The course consisted of two limbo bars; pilots had to fly inverted over the tallest one and then drop down into an elevator and fly under the lower limbo bar. This was extremely difficult to do because the wind had begun to kick up quite a bit; however, 15-year-old Will Holderness completed the tasks on his first try, and that prompted Bob to make another challenge to Will. Bob announced over the loudspeaker,





## SPONSORS

*3D Flyer*
Abeo RC
Aeroworks
AirWild
Commercial Capital Bank
Duralite Plus
Fromeco Scale Avionics
"Inside R/C"
*Model Airplane News*
Smart-Fly
TNT Electric Co.
Tru-Turn



**Counterclockwise from top left:** Joe McBride performs a perfect wall before the pylon. • Stephan Veillard hovers his Edge 540 over the pool and then dunks the tail to complete one of the obstacle-course requirements. • Smokin' Joe hands the real transmitter (for the Pitts Monster) to Jason Saulten so he can continue his flight demo. • In reponse to Bob Sadler's challenge, 15-year-old Will Holderness's foamie touches each of the flags at the top of the pylons. • Bob "Mouth of the South" Sadler, organizer extraordinare, in a proud moment. • Large and in charge! This beautiful 33% Ultimate from AeroWorks performs a nice, inverted pass.


**Garrett Morrison's 37% Columbo Anderson Extra makes a low knife-edge pass during the obstacle course competition.**

Ken Adams brings his aircraft down on the deck for a nice, slow, harrier pass.

## FLYING CIRKUS LINGO

COURTESY OF SMOKIN' JOE McBRIDE

**Aunt Jemima**
1. Re-kit pancake style.
2. A pull-out that ends too low, resulting in the plane's pancaking. The magnitude of the damage determines whether it is classified as a short or a tall stack.

**Cirkus style**
An attitude that's all about checking your ego and politics at the gate and enjoying the hobby to its fullest. It involves pushing each other to greater levels of piloting and prom oting the hobby and each other in a purely positive way.

**Community service**
The act of helping a friend retrieve the debris from a "yard sale."

**Compactor**
What happens when you're in a torque roll and the motor drops out, so your fuse ends up taking on the accordion shape of a squashed tin can. This maneuver is best left for the end of a freestyle routine.

**Depth charge**
From high-speed inverted flight, the pilot performs a double positive snapasaurus resulting in rapid deceleration and ending in a low-altitude, upright harrier.

**Huck it**
To throw the plane around on the deck. It usually involves flying out of your comfort zone. Possible uses: "He hucked it on the deck," which means: "He did an extremely low torque roll."

**O.P.P.**
[Other Peoples' Planes] Usually uttered incredulously by other pilots when a friend offers you a flight on his plane and you proceed to fly with total abandon and blatant disregard, since you didn't build it! Also referred to O.P.S. (you figure it out).

**Smackdown**
A byproduct of a mistake made by one of two pilots hovering in formation when one finds himself in the propwash of the other plane. The radical loss of thrust can lead to an Aunt Jemima or a compactor.

**Snapasaurus**
This is a 3D snap that's entered from high speed with high throttle. Audible ripping of the air by the wings is heard over the engine noise. As Bob Sadler likes to say, "This is a maneuver that separates the wings from the plane!"

**Throw down**
1. A challenge.
2. A 3D showdown

**Yard sale**
The results of a high-energy crash that totals the airframe and scatters debris over a large area (also see 50-grit pass).

**50-grit pass**
A knife-edge or inverted pass that's low enough to leave some MonoKote, balsa and foam on an asphalt runway. On a grass runway, this is also known as a cartwheel.

"Will, if you can touch one of those flags that's on top of the pylons for the obstacle course with your plane, I will give you a Flying Cirkus T-shirt!" Will did that within a minute and then proceeded to touch the other two flags on the other pylons. He did all of this while standing in the pilots' area, which was a good 30 to 40 feet from the pylons.

Smokin' Joe McBride was the first person to fly the main 3D obstacle course (he was also the designer). The course setup included a tall center pylon flanked by two shorter pylons, a 2-foot-deep wading pool and overfilled water balloons scattered on the ground. The pilot's time began once the plane was airborne, and the first requirement was to perform a knife-edge parallel to the runway below the lower pylons. After that, the pilot was to fly the plane above the center pylon and then perform an elevator—dropping the plane below the shorter pylon before passing it. Next, the plane had to fly past one of the shorter pylons in normal flight, perform a wall and then stop before it reached the center pylon. The pilot had to have the plane do a low harrier up to the pool, then dip its tail into the water, and then perform a torque roll. The pilot completed the obstacle course by having the plane pop one of the water balloons with its tail.

After Smokin' Joe completed the course with a time of 2:19, pilot after pilot lined up to take a shot at breaking the record time. Stephan Veillard was the first to hit the course after Smokin' Joe and, according to announcer Bob, he finished in 2:19. According to Bob, every single pilot who flew the course managed to come in right at 2:19. I think there may have been something wrong with his watch.

### FINAL FLYBY

Sunday's schedule was the same as Saturday's, although there seemed to be more time for plain old fun flying. This event was organized so that everyone would have fun, and thanks to the Flying Cirkus crew, the Pomona Valley Model Airplane Club and the proud sponsors, that is exactly what happened. Everyone I spoke with said they thoroughly enjoyed this event, including those who were willing to post their comments on the Flying Cirkus website late Sunday night after a long day of traveling home. Jim McQueen posted, "This event has set the bar for all other events of this nature." Flygremlin wrote, "The hospitality was second to none. It was something that really blew me away." And Jim C. summed it up with, "$218 for plane ticket; $170 for hotel room; $70 for rental car. Flying with one of the finest groups of 3D fliers and all-around great people? Priceless!"

You won't want to miss the 2006 Fly-In, so be sure to check out the Flying Cirkus website for details on next year's event. While you're visiting flyingcirkus.com, be sure to hang around and chat on the friendly forums and maybe make a friend or two at this informative and enjoyable website. ✚

BY DON EDBERG > PHOTOS BY JOHN REID

# ULTIMAT RADIO

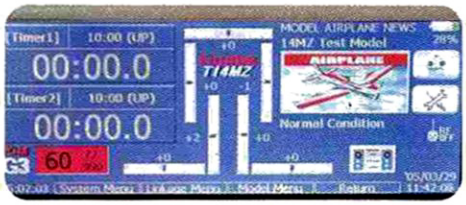
## FUTABA 14MZ—NEXT-GENERATION COMPUTER TRANSMITTER

**THE NEW FLAGSHIP SYSTEM FROM FUTABA, THE 14MZ** is a giant leap forward in radio-control technology. Not only does it have all the bells and whistles you'd expect to find on a 14-channel (!) radio, but it offers a color touch-screen graphic interface, very impressive programming options and incredible data-storage capabilities as well. You can even program the transmitter to "talk" and tell you which function each switch has been programmed to activate! Still not convinced? With the 14MZ system, you'll never have to wait for a frequency pin again! Read on to see what else this "radio of the future" has to offer.


T14MZ-2P
POWER
[Timer1] 10:00 (UP)
00:00.0
[Timer2] 10:00 (UP)
00:00.0
Futaba
T14MZ
MODEL AIRPLANE NEWS
14MZ Test Model
29%
Normal Condition
PCM
60

You can activate the touchscreen with the factory-provided stylus or by using the rotary knob below the screen to access the Linkage, System and Model menus. Four shortcut buttons at the bottom of the display allow immediate access to the menus you use the most. The touchscreen graphic interface makes it easy to switch between model-setup programming options.

Why so many channels? Well, complicated models need them! The 14MZ has 14 receiver-channel outputs to plug each servo in directly! Twelve channels are linear; the other two can be used for on/off functions such as retracts. Let's say you have a model with 3 servos on each aileron (2x3 = 6), 1 servo for each side of the elevator (6+2 = 8), 2 servos for the rudder (8+2 = 10), throttle, smoke, retracts and gear doors, wheel brakes, air brakes, etc. That adds up to 14 pretty quickly! Jet pilots need the extra channels for steerable nose gear, retracts, wheel brakes, air brakes, leading-edge high-lift devices and for scale effects such as sliding canopies and bomb drops. Sailplanes can have as many as five control surfaces on each wing and still have channels left for the tail and other things such as spoilers, retracts, water drop, etc. You could build a multi-engine model, slave 4 throttle servos together and still be able to "tweak" each engine's servo to account for individual engine differences; you get the idea.




**The 14MZ's color screen tells what's going on with the model, transmitter, frequency and more! Program it via the touchscreen or rotary knob (bottom, center). Four buttons at the bottom take you immediately to the commonly used screens.**


**All the settings in the 14MZ are displayed. It's far easier to understand a bar graph than a group of numbers in a row.**


**This 33-gram/1.16-ounce receiver provides 14 servo outputs and has programmable frequencies.**

## AIRBORNE SYSTEM

Note that the surprisingly small and light, 33-gram (1.16-ounce), 14-channel R5014DPS receiver does not have a crystal. The 14MZ provides synthesized frequency generation, and that means you don't have to worry about waiting for a frequency or looking for a crystal! You can choose from all RC frequencies at will. The 14MZ system includes a Wireless Frequency Setting System (WFSS); you select a frequency and then press a button. The transmitter sends out an extremely weak signal to program the new frequency into the receiver. After cycling the transmitter's power switch, the transmitter and R5014 receiver are on one of the 50 built-in U.S. frequencies. Complex models may require two receivers. Each receiver's serial number is coded into the transmitter, so you cannot accidentally change someone else's frequency when you change your own! The WFSS does not seem to monitor the selected frequency; the user still must ensure that the frequency is clear before transmitting (the transmitter politely asks if you wish to transmit every time you turn it on).

Servos, however, are not included with the system. I guess Futaba assumes that buyers will have their own servo requirements, so it would be impossible to satisfy everyone's needs.

## MODEL TYPE AND CONFIGURATION

To make the 14MZ versatile, configurations for four main types of models—airplanes, helicopters, gliders and electric-power gliders—are built in. It's unusual to see a separate category for electric gliders, but these models have unique requirements. You may choose from seven conventional wing types (from one to four ailerons and flaps on each panel), six flying-wing configurations (with two rudder choices) and three tail types (conventional, V-tail and differential elevators), and chopper pilots may choose from among seven swashplate types. You may also program for up to four engines with independent throttles in which the idle and high-throttle positions are different for each. The preprogrammed configurations cover almost any

## SPECIFICATIONS

**Manufacturer:** Futaba
**Distributor:** Great Planes Model Distributors

**TRANSMITTER**
**Model:** 14MZ
**Type:** aircraft, heli, glider, electric glider selectable
**Channels:** 14 (12 proportional, 2 on/off)
**Modulation:** 2048 PCM (1024 PCM and PPM/FM selectable)
**Frequency:** synthetic generation, 72 or 50MHz bands (no crystals needed)
**Power source:** 7.4V Li-ion transmitter battery

**RECEIVER**
**Model:** R5014DPS
**Type:** 14-channel
**Frequency:** synthetic generation, 72 or 50MHz bands (no crystals needed)
**Size:** 2x1.5x0.65 in.
**Weight:** 1.16 oz. (33g)

**INCLUDED IN SYSTEM**
- 14MZ transmitter, including RF module
- R5014 DPS receiver
- Compact Flash memory card
- Li-ion transmitter battery charger
- Wall charger for receiver battery
- Ni-Cd 4.8V receiver battery
- Aluminum carrying case
- Switch harness
- Aileron extension cord
- Y-harness
- Direct Servo Control (DSC) cord
- Adjustable neck strap
- Frequency flag
- Rubber-tipped stylus
- Toggle-switch wrench; 2.5mm and 1.5mm hex wrenches
- Instruction manual

**SERVOS**
Available separately

**PRICE**
$2,199.99

imaginable model type—just one of the many built-in shortcuts that makes this radio so powerful yet easy to use.

### TRANSMITTER

The 14MZ transmitter uses a Li-ion battery as a primary power source (no memory backup power is needed). The 7.4V, 2200mAh battery must be removed from the transmitter and inserted into an external cradle for charging (an internal socket is provided for field charging). When fully charged, the battery provides more than 3 hours of operation.

The 2048-bit PCM provided by the 14MZ is double the resolution of any other system and is said to be 40 percent faster than the older PCM 1024 transmission. I wasn't able to measure its speed, but I did notice that when I pulled and released the sticks, they "bounced" as they came to neutral, and my servos tried to follow that bouncing motion! If the 2048 PCM can respond to those vibrations, it must be quite fast. The speed is really noticeable on models with large control surfaces that have lots of throw. This is also an indication of how smooth and glassy the sticks are!

Other physical aspects of the 14MZ transmitter include that the sticks can be lengthened or shortened, their spring tension can be adjusted, and the angle at which the stick points (towards or away from the center of the case) can be changed! If you fly choppers and fixed-wing models, you're able to switch between the ratchet feel and no ratchet on the throttle stick without disassembling the case. Four handy slider levers (two on each side) can be used for controls or trims and adjustments such as engine mixture, glider camber, etc. Note that on each side of the transmitter, one of the sliders can be accessed from both the front and the back—versatile!

Futaba receiver owners will be glad to know that the 14MZ transmitter can operate any PCM 1024 receiver (9 channels of output) and any PPM/FM receiver (8 channels)! Unfortunately, to change both modulation and frequency, you have to go through the frequency menu twice and power down twice (it would be nice to be able to change both in a single sweep of the menus).

Futaba allows you to customize your transmitter. If you would like to relocate any of the toggle switches on the top of the case, unscrew the switch panel, move them, reattach the panel and then tell the software what you've done. Another cool feature is that you can recess the pushbutton knobs on either side of the top center. With one push, they retract into the case and cannot be moved accidentally! The antenna is "bayonet-mounted"; you can install and remove it instantly by pushing and rotating it ¼ turn. When removed, the antenna is stored inside a tiny access door on the transmitter's side. Since the antenna is mounted on a sphere, it can be rotated to any angle.

**Two side-slider levers on each side of the transmitter case allow easy control inputs without your having to let go of the sticks.**

The 14MZ has a metal handle on the top rear of the transmitter and a plug-in RF module in the back. A rubber access panel covers the trainer socket (the trainer system works with 9Z, 9C, 8U, 7U, 7C, 6Y, 6EXA, 6EXAS, 4V and 4YF transmitters) and the headphone jack; the plastic battery door is below that. Besides the mechanical features, the transmitter has a very comfortable feel, and it comes with a very nice carrying/storage case.

Now let's talk about software features. Futaba has equipped the transmitter with Compact Flash (CF) data-storage capabilities. The CF card is plugged into a socket hidden under an access panel on the side of the case. The provided 32MB card can hold the data of more than 200 models (the transmitter itself holds data from 30 models). The models can all be different types, and you can assign names to every model (up to 32 characters, with upper- and lower-case

## SYSTEM HIGHLIGHTS

- **Large, full-color touchscreen**
- **Superfast response with 2048-bit resolution**
- **Built-in, 30-model memory**
- **Compact Flash memory card**

## SYSTEM FEATURES

The Futaba 14MZ has four menus: one each for powered aircraft, helicopters, gliders and electric-powered gliders.

- 2048 PCM resolution for quicker response
- Large, full-color, HGVA touchscreen (640x240 pixel resolution) with transflective technology (layered transparent and reflective surfaces)
- Adjustable screen backlighting and contrast
- Dial-N-Key button
- Dual internal processors
- Input for general operating tasks such as setup and programming is processed by Windows CE
- Preprogrammed mixes (seven wing types, four tail types and three motor types)
- Servo grouping (multiple servos for a single control function can be set up and then plugged into different receiver channels; no servo synchronizer required)
- Switch and function assignment
- Switch customizing (eight shoulder switches can be reconfigured according to your preferences; just pull out switch, and plug in preferred style)
- R5014 DPS synthesized receiver with wireless frequency setting system (WFSS) for changing frequencies without changing crystals.
- Li-ion transmitter 7.4V, 2200mAh battery (2 to 3 hours of run time per charge)
- Compact Flash card data storage and transfer
- Built-in 30-model memory (can be expanded to 100 models using the supplied Flash memory card)
- Capable of uploading digital images (identify your model memory setting with a picture of the model displayed on the graphic menu)
- Create and store audio files (enables you to fly with music or flight call sequences). Built-in microphone for recording and storing up to 24 voice prompts

# USING THE 14MZ FOR 3D

**THE GENRE OF 3D HAS EXPLODED WITHIN THE SPORT OF** model aviation. I see many new young faces at the flying field, largely as a result of the extreme nature of this aspect of modeling. No other category of flying encompasses such a wide range of model sizes or types: from a ½-pound "Shocky" up to a 45-pound, 44-percent 150cc TOC scale aerobatic model. Flying 3D is a great way to be creative and crazy (always observing AMA safety guidelines, of course). Any tool that can be used to explore the "edges of the envelope" is certainly sought after.

The Futaba 14MZ is just such a tool! The extreme throws required by the huge control surfaces won't tolerate a lack of precision anywhere in the system. Multiple servos are often used on a control surface, and several third-party devices align and adjust servos to eliminate the "tug of war" between them. The 12 proportional channels available on the 14MZ eliminate this problem. Imagine being able to put 3 servos on a big aileron and plug each servo into its own channel on the receiver and then set the endpoints for each servo independently for perfect harmony!

I do not like flipping a bunch of switches while I fly. The 14MZ allows you to assign any function, channel, or trim to any switch, lever, or stick. You can even assign several to the same switch. This permits me to assign all dual rates to one switch. I also have several models that benefit from a "snap-flap" condition (flaperons mixed to travel in the same direction as the elevator). I use a single 3-position switch to change from low rate to high rate to high rate with snap-flap mixing. Exponential throws have become a must-have for many 3D enthusiasts. This option essentially makes any given function softer around neutral stick. In low rate, I employ a small amount of expo. For high rate, I use the graphical display to match the slope of the deflection curves near center, but when I put the stick in a corner, the full control-surface deflection is there. The ability of the 14MZ to display the low and high rates on the display concurrently enables you to visually align the deflection curves around center stick. When setting up a 3D model, it's a good idea to max out all deflections to 140 percent first; use the shortest servo arm and the longest control horn that allow you to achieve the desired throws. This will give the best resolution and mechanical advantage to the servos.

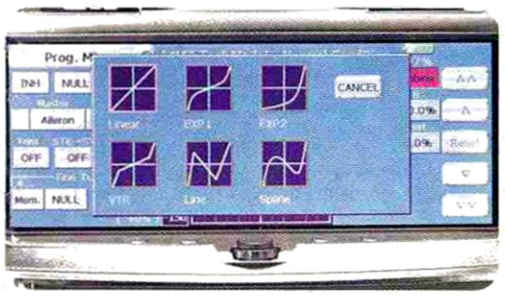
For those who fly a freestyle program, Futaba has included in the system a media player that can be set up to play any WMA format audio file. Simply download your favorite music from your computer onto the CF card and put it into the transmitter for playback whenever you want. It also allows you to record 3-second .wav files and download them for "self-calling" a sequence. Each flip of a switch can play back the next .wav file.

Those who are familiar with the Futaba 9Z radio's programming will find the 14MZ a snap to program. If you are not familiar with the 9Z, you will still find programming the 14MZ a snap!

***—Mike Stroup***

click trip MODELAIRPLANENEWS.COM SEE A TYPICAL 3D TEMPLATE


**You can store model setups, model pictures, sounds and music on the CF card, and you can record sounds to play when a switch is toggled! This is an incredibly useful feature.**




**All of the primary functions and all of the programmable mixers can be represented by different types of curves.**


**A custom model image may be pasted into the 14MZ's model memory. Identifying models could not be easier!**

characters input by touching a keyboard-type display). You can remove the CF card, plug it into your PC and email your model setups. I foresee "libraries" of preprogrammed models that are downloadable for quick setups.

The 14MZ also can use and display custom picture images that may be pasted in and used to identify a particular model. These are stored in the CF card. If that isn't enough, you can also store music files and listen to them through the speaker or headphones plugged into the audio jack. You're able to record your own sounds and attach them to the motion of a particular switch! This way, the 14MZ will say "retracts" or "gear down" or whatever you like when you flip the switch for a function. Of course, every stored model can have different switches and associated sound bites. This is great for when you can't remember which switch does what!


**The rotary knobs can be used to adjust trims and controls. They are recessed in the transmitter case with a simple push. Once recessed, they're impossible to move!**

The 14MZ has all the "usual" computer-radio functions, including subtrims, servo travel, reversing, fail-safe, engine cut and two independent timer circuits. There are eight nameable flight conditions available for each model memory that allow a variety of sets of neutrals, travels, mixes and much more, including smooth transitions, etc. A servo monitor provides a servo-motion bar graph so that you can see what happens when different controls or levers are moved. Select, copy, save and delete functions handle all the model memories.

The servo responses in various functions are not limited to "linear" or straight-line; the 14MZ also provides bilinear response (a different slope on each side of neutral), determined by points (up to 17 points may be input by the user) or smoothed curves. All of the responses may be tweaked horizontally and vertically simply by pressing a button.

The 14MZ offers several preprogrammed mixers: airbrake, aileron-rudder, airbrake-elevator, rudder-aileron, rudder-elevator, snap roll, ailevator (dual differential elevators), fuel mixture (throttle-needle valve) and others. For those modelers who push their skills to the limit, 10 freely programmable mixers allow you to slave channels so that you can handle unusual models such as the six-engine B-36 (the built-in throttles handle "only" four engines) and twin-rotor helicopters. The mixers allow the slave to follow the master movement in the many response curves mentioned previously. This ought to cover it all!

**You can select custom switch positions on either side of the transmitter. Switching takes just a few minutes, and the tools come with the transmitter. Have it your way!**

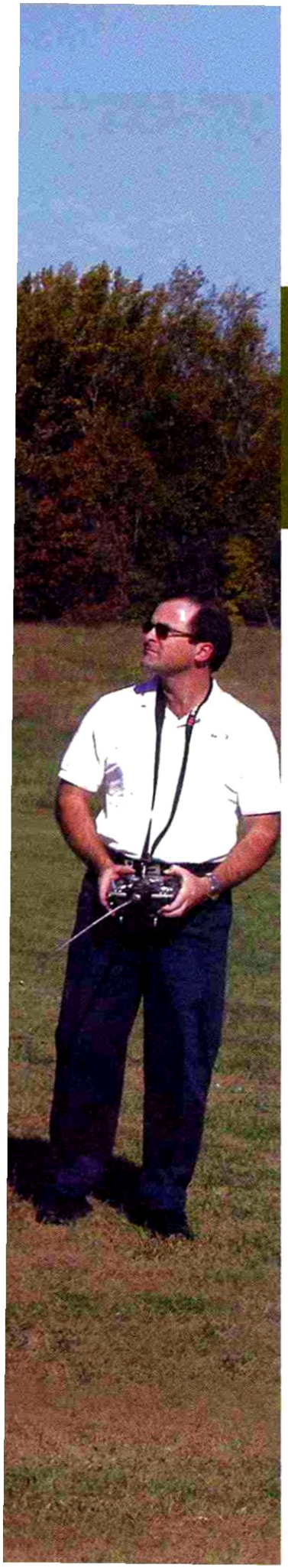
The 14MZ doesn't give me much to complain about, but I'll take a stab at it. The stylus isn't stored in the transmitter, so it's easy to misplace. A detailed index would improve the manual; the table of contents doesn't have enough items in it. Last, the transmitter doesn't allow you to program tails with two vertical rudders (such as the Ercoupe's).

For more details, visit the website: 14mz.com. You can download the owner's manual at futaba-rc.com/manuals /14mz-comp-manual-v1.pdf, and explore it to your heart's content!

*See the Source Guide on page 151 for manufacturers' contact information.*

PHOTO BY SANDRA SOMENZINI

**Quique makes aerobatics look easy! Even for him, however, the harrier roll required a lot of practice to master.**



**BY** QUIQUE SOMENZINI **ILLUSTRATIONS BY** FX MODELS

# The Harrier Roll

## Freestyle aerobatic technique

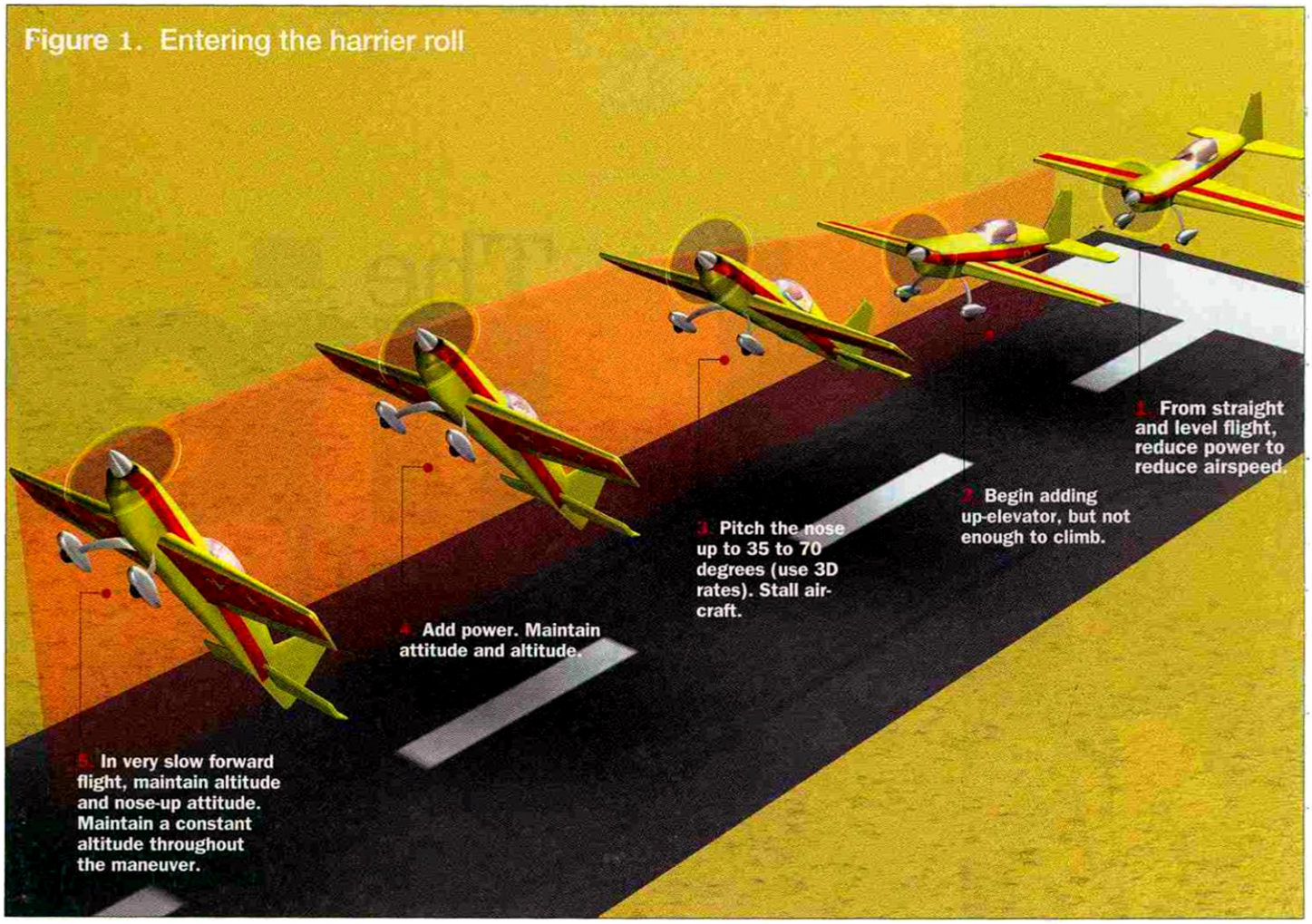
**3D AEROBATICS WAS BORN ON THE DAY THE HARRIER MANEUVER WAS PERFECTED.** At the time, I called it the "cobra," but it soon became more popularly known as the "harrier." The harrier roll grew out of that basic maneuver, and it is one of the most spectacular 3D moves you can add to your flight routine. Like all demanding maneuvers, it requires a lot of practice to nail down. In this article, I'll take you through the finer points of the maneuver.

### WHAT IS A HARRIER ROLL?

It is important to understand that the harrier roll is a 3D maneuver that requires the airplane to be in a nose-up attitude, i.e., more than 35 degrees, while it maintains a constant altitude during the entire maneuver. If the nose is not that high, you are simply doing precision rolls.

The harrier is 3D flying at its best because it requires a true mix of lift and propeller thrust to keep the airplane in the air at well below the model's stall speed. While flying at a very low forward speed, the nose must be held up; a lot of elevator throw is needed to keep the airplane in the harrier attitude. Now, simply do an aileron roll at the same time, and you turn the harrier into a harrier roll.

Basically, all a pilot needs to do is to keep the model's nose high—between 35 and 60 degrees—while the airplane rolls continuously. This is easy to explain but difficult to do.




**HOW IT'S DONE**

As always in aerobatics, perfecting a maneuver takes a combination of pilot skill, proper technique, airplane setup and airplane design. Of course, a lot of practice is also required.

**Technique.** To keep the airplane in the nose-high attitude during the roll requires a graceful mix of risk and finesse. You have to use all four control functions—rudder, elevator, throttle and aileron—with great coordination.

If you roll to the left, the airplane will be able to roll faster at a slower airspeed because of engine torque. Start at an altitude that's comfortable for you but not too high. You'll want to keep the airplane close enough to see what's happening. Throttle back to reduce the airspeed, select your high-rate mode, and pull up-elevator slowly to lift the nose (but not so much that the aircraft starts to climb). Maintain your entry altitude. Keep pulling until you reach a nose-high attitude of 30 to 35 degrees. By now, the airplane has stalled, but by adding power, you can prevent it from losing altitude. You have just entered the 3D aerobatic world!

If the airspeed is correct, even with high rates (with aileron travel at around 40 degrees), you should have a constant roll rate of about 1 to 1.5 seconds per roll. Use full left aileron, and maintain the nose-high position until you've completed the first roll. When you see the airplane start its roll, add right rudder, but don't go to neutral elevator until the airplane reaches the first knife-edge position. Full right rudder now maintains the nose-high attitude. As you go from knife-edge to inverted, decrease right rudder and push in some down-elevator to keep the nose up. Now, from inverted to the second knife-edge, proportionally reduce down-elevator while transitioning from neutral rudder to left rudder. You should have neutral elevator and full left rudder when you enter the knife-edge position. Continue from knife-edge to upright, and keep doing the same thing: reduce rudder deflection and increase up-elevator until the airplane reaches a fully upright position again.

So, remember: use elevator inputs to maintain a nose-high attitude in the upright and inverted positions, and use rudder inputs in knife-edge positions. How much elevator and rudder travel you'll need will vary and will depend on the airplane's position. You should have neutral elevator during knife-edge and neutral rudder when upright and inverted. Positions between knife-edge and inverted/inverted require a mix of the two inputs. For example, while in the 45-degree position between inverted and knife-edge, elevator and rudder are both deflected by about the same amount. As you approach the knife-edge, rudder deflection must be increased and elevator decreased.

The technique for flying consecutive rolls is the same; it requires repetition. Once you get the coordination and rhythm down, you will be able to make as many rolls you want. To exit the harrier roll, add full power and reduce elevator to transition into normal forward flight.

**Power management.** During the maneuver, you'll see that the airplane will slow down because of the added drag generated by the aileron, rudder and elevator deflections. Increase power to maintain

altitude and the slow forward motion. I suggest that as soon as you start to roll, you add three or four clicks of power, and keep an eye on the airspeed. If you see that the model is losing airspeed, or you feel that you can't keep its nose up—even with full control-surface deflections—add power. Another symptom of insufficient power is that the aileron roll rate will be too slow. With proper throttle management, your airplane will feel light.

**TIPS**

- Practice with your airplane flying into the wind.
- Maintain a constant roll rate.
- Always use the throttle. Throttle control is very important to keep the airplane flying at the same level altitude and to hold its nose up. It makes all the difference.
- Don't use your smoke system until you are used to flying this maneuver. Sometimes, smoke hides the airplane and makes it hard to see what's going on.
- Practice the harrier roll in both directions—left and right. Keep in mind that the roll rate to the left will be faster at slower airspeeds because of torque.
- Fly the harrier roll at lower altitudes only when you are 100-percent confident of your ability to execute the maneuver.
- Never change the aileron-stick's position. The ailerons should stay at full deflection at all times. To keep the roll rate constant during many consecutive rolls, adjust the throttle slightly to increase or decrease airspeed.

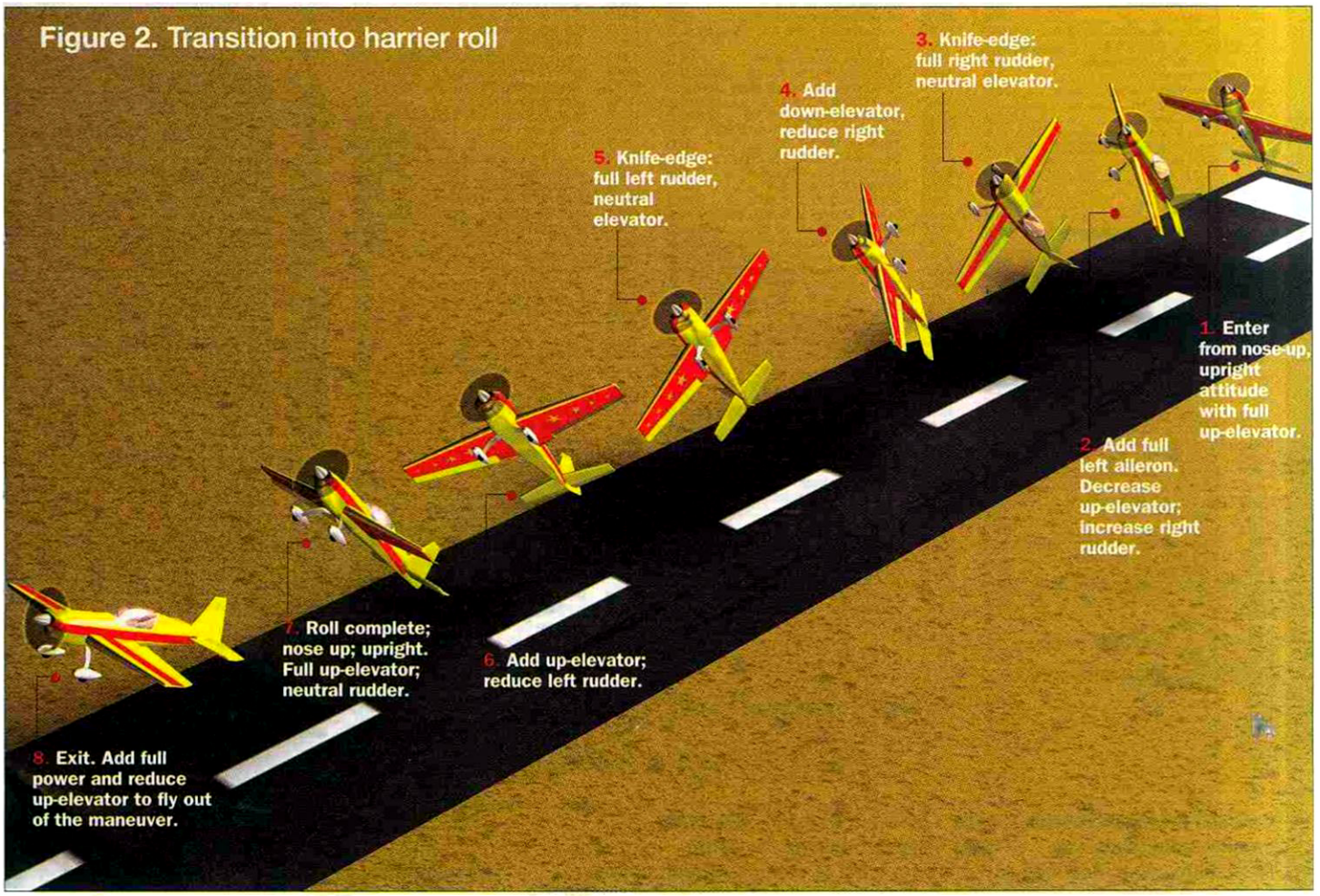
**Radio setup.** As with any 3D maneuver, you'll use high rate for the harrier roll. Rudder, elevator and aileron must travel to their maximum deflections if you're to perform the maneuver properly. High rates will also help you to recover from unwanted situations, especially at the beginning, when you're learning. Remember that the slower the airspeed, the higher the travel rate you'll need to keep the airplane flying within the 3D window.

For rudder, it can be slightly different. I fly Mode I, and I have a tendency to fly with a more sensitive rudder than Mode II pilots. If you fly Mode II, it might be best to set up rudder for about 80 percent of its total travel.

Exponential is also very important to dialing in the right feel. Never try to use too much exponential, as this will cause you to be too late with your control response, especially with the elevator. I find that less exponential on the rudder and elevator is better for the maneuver because of the high roll rates and the continuous rudder and elevator-stick movements. Higher exponential gives a softer feel around neutral, but it can slow your control inputs. As always in aerobatics, you need to find an exponential setting that is a good compromise for the maneuver and for the rest of your flight routine.

I think you should also keep all your special programmable mixes active. Your airplane should perform at its best and fly as straight as possible with regard to pitch- and roll-coupling. In an upcoming article, I'll go into airplane choices and setup in more detail. Aerobatic flying remains a combination of pilot skill, flying technique, airplane design and radio setup. Having to learn to get the best out of yourself and your plane is why I think aerobatics is one of the most challenging segments of aeromodeling.

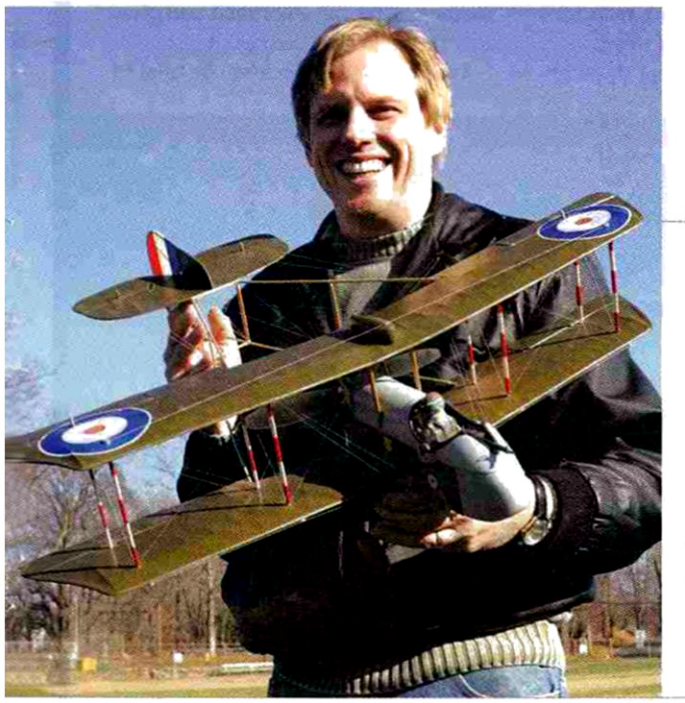
Until next time!



BY DAVID JOHNSON > PHOTOS BY DAVID JOHNSON, PETER HALL & DERON NEBLETT

# AIRCO DH2

## A CLASSIC WW I PUSHER BIPLANE



**IN LATE 1915, A YOUNG BRITISH DESIGNER NAMED GEOFFREY DE HAVILLAND** developed a worthy adversary for the Fokker E.III Eindecker that was wreaking havoc on the Allied air services. Although somewhat slow, the Airco DH2 was extremely maneuverable. Because the RAF had not yet perfected a synchronized machine-gun system that could fire between the propeller blades, he chose a pusher configuration for the DH2 so the guns could be fired straight ahead. The DH2 brought the "Fokker scourge" to an end. My model has the same maneuverability as the original and will certainly provide great slow-flying action! Let's get started on the model.

This is the basic fuselage structure and homemade formed nose piece. It was made by carving foam and covering it with glass cloth and resin.

## SPECIFICATIONS

**WINGSPAN:** 32 in.
**LENGTH:** 25.5 in.
**READY-TO FLY WEIGHT:** 9.2 oz.
**WING AREA:** 268 sq. in.
**WING LOADING:** 4.68 oz./sq. ft.
**SERVOS USED:** GWS Pico
**MOTOR USED:** geared Graupner Speed 280
**PROP USED:** GWS 11x4.7
**ESC USED:** GWS 10A
**BATTERY USED:** Kokam 2-cell, 740mAh
**RADIO USED:** Futaba 8UAP

### CONSTRUCTION

All of the tail surfaces have laminated outer edges made of four strips of 1/32x1/8-inch balsa. I soaked them in water and wrapped them around lite-ply forms. Coat each strip with yellow wood glue and create a strip four layers deep. Pull the lamination around a plywood form, and hold it firmly in place with pins. After a couple of days, remove the laminations from the forms, and trim the forms to length. Place them over the plans, and add the inner ribs. The control horns should be installed after the surfaces have been covered and painted.

The wings are straightforward, and all of the wing panels are essentially the same. Cut the ribs to shape, and glue them to the leading and trailing edges. Cut the spars a little over length and install them in the rib notches. The one-piece wingtips are formed by laminating two layers of 1/32-inch balsa to form a bow shape that matches the ribs. Cut them to shape and install them after the wings have been assembled. To build the ailerons, I cut the ribs off behind the spar and then cut the aileron rib sections to length after they had been removed from the wing.

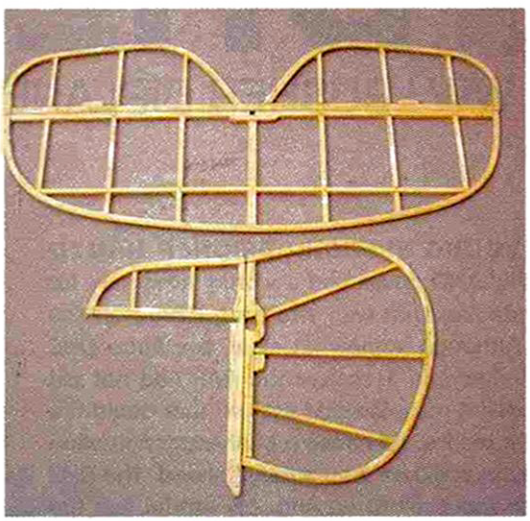
The upper and lower wings are built in the same way, but the lower panels' spars extend 1/8-inch out from the root rib and are plugged into the fuselage sides. Glue the upper panels securely to the center section with 3/4-inch dihedral under each tip. Don't add the aileron horns until after the parts have been covered and painted. Glue small triangular pads to the wing spars for attachment points for the wing struts. Small pinholes in the pads accept the alignment pins that protrude from the ends of the wing struts.

### BUILDING THE FUSELAGE

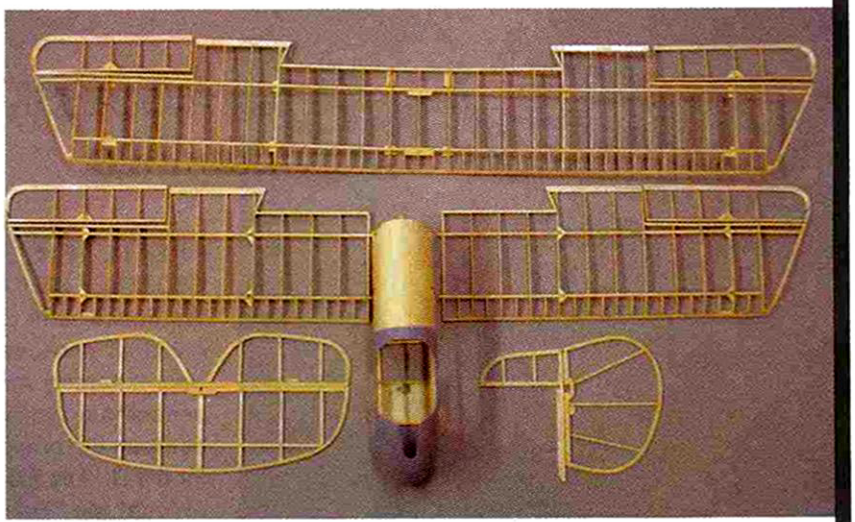
Build each side frame over the plans; then assemble the sides with the crosspieces placed in between them. Glue the top formers into place, and then add the 1/32-inch balsa rear decking. Cut small openings in the sheeting for the front cabane struts.

I made the nose piece by carving a Styrofoam block and then covering it with two layers of 1-ounce fiberglass cloth and epoxy resin. Cut out the cockpit opening, and trim the nose piece to fit the fuselage. Once you're satisfied with the fit, remove the foam. Glue the outer shell into place after the model has been painted.

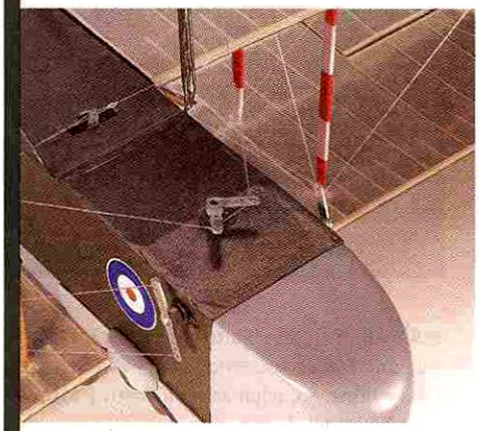
Use very hard, 1/8-inch-square balsa to



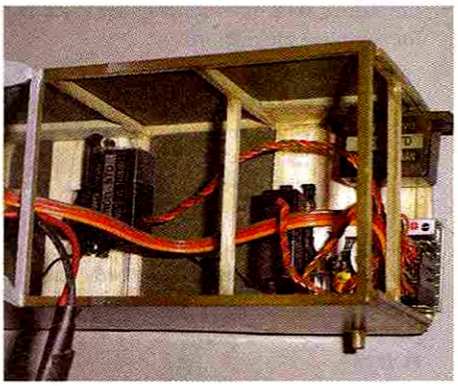
The tail surfaces have laminated outlines that are shaped around lite-ply forms.



Here are all of the completed parts for the DH2. The structure is very light and, when rigged with thread, it's very strong.



The servo arm on the side of the fuselage is for elevator control, and the V-shape servo arm controls the rudder. You can just see the aileron servo arm protruding from the fuselage between the two lower wing panels.



Note the servo and receiver installation in the fuselage.

The aileron pull-pull control setup uses pulleys attached to the wing to change the direction of the thread "cables."

make the tail booms. You can also make them out of ⅛-inch dowels if you sand them down a bit. Before you cover the model, install the motor mounts.

**POWER SYSTEM AND RADIO GEAR**

The power system is uncomplicated and provides plenty of power for the DH2. I used a Graupner Speed 280 Race motor and a 4:1 gearbox to turn an 11x4.7 APC Slow Flyer propeller. To power the motor, I used a GWS 10A ESC and a Kokam 2-cell, 740mAh battery pack. I used three GWS Pico servos and a Futaba receiver and transmitter.

**FINAL ASSEMBLY**

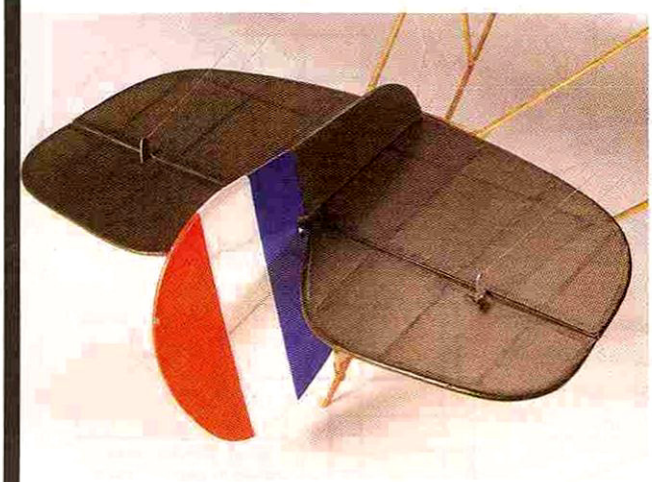
I covered my model with Peck-Polymers Japanese tissue and shrunk out the wrinkles with water sprayed with an atomizer. I then applied three coats of Sig Lite-Cote dope. I cut openings for the servos and glued them into place. I applied a very light coat of Sig Olive Drab dope to all of the green areas and the exposed portions of the servos. Once the dope has dried, install the battery tray, and glue on the nose piece.

Cut out four sets of front and rear interplane struts; then cut out a pair of front and rear cabane struts. Sand them all to shape, and stain or paint them as you like. Insert the alignment pins into each end of the interplane struts and into the tops of the cabane struts so that only 1/16 inch protrudes.

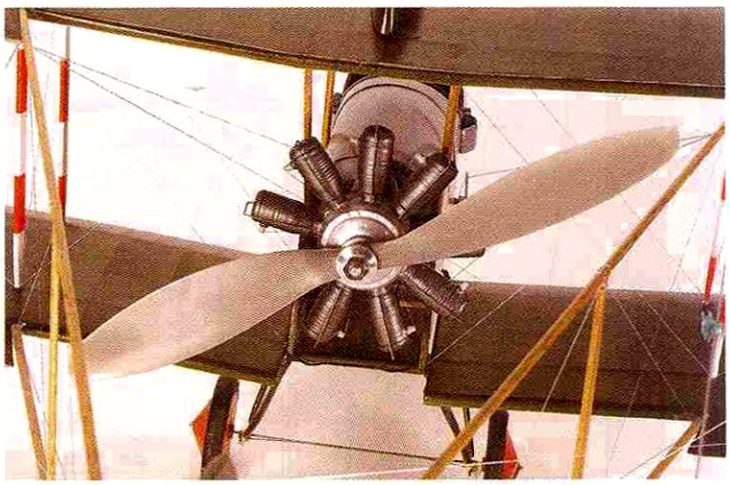
Epoxy the cabane struts to the fuselage as shown on the side view; they should be vertical when seen from the front. Place the top wing on top of the cabane struts, and push the lower wing panels into position. If everything is square and the wings are aligned, glue the upper wing to the cabane struts. To glue the lower wing panels into place, apply glue only to the strut stubs that key into the fuselage. Install the interplane struts in pairs working outboard, and use only a small drop of CA to attach the ends.

It's easiest to rig the wings before you install the tail booms. In an X-pattern, attach the cross-bracing threads between the center pairs of interplane struts. Start at the rear lower wing root spar, and pull the thread in between the root rib and the fuselage; then glue it to the wing's underside. Cross up to the top of the middle strut, and continue until you get back to the top of the cabane struts where you will tie off the thread. Now repeat the process, starting at the lower leading edge.

Tack-glue the ends of the tail booms to the trailing edges of the wings with the rear upper crosspiece installed. Glue the vertical fin to the horizontal stabilizer, and slide them onto the booms. Tack-glue the leading



The tail surfaces are attached to the top tail booms and crosspiece. The control horns should be installed after the surfaces have been covered and painted.



The dummy rotary engine easily hides the Graupner motor and gearbox.

edge of the horizontal stab to the crosspiece; then carefully check its incidence. When the incidence is correct, glue the stab into place; then glue the lower booms to the vertical tailpiece. Add the tail rigging using the photos as a guide; then glue the landing-gear wires to the fuselage and add the balsa fairings.

### PULL-PULL CONTROL

Basically, the control system is a closed loop that uses "SpiderWire" fishing string. The string begins and ends at the control horns. I used ⅛-inch-long pieces of Teflon tubing as guides on the underside of each wing's trailing edges just inboard of the booms. Thread the control strings from the control horns, through the guides to the servo arms. Then thread the string back to the control horn. Center the servo arm and the control surface; pull the strings tight, and lock them to the servo arm with a drop of CA. The aileron rigging uses small pulleys to change the strings' directions. Refer to the Click Trip for complete instructions.

### CONTROL TRAVEL

**Elevator:** ½ inch up and down
**Aileron:** ⅜ inch up and down
**Rudder:** ¾ inch left and right

That's about it! To finish off the model, install the battery pack and add any scale details you desire; just keep it light.

### FLYING

Make sure that the center of gravity is 1½ inches behind the top wing's leading edge. Set the plane on a smooth surface; throttle up to about ⅔, and you're flying! The plane is very stable, and it will loop from level flight. Stall turns are a thing of beauty. Only the brave should attempt a roll. I have successfully completed several, but they bring a whole new meaning to the term "barrel roll"! All in all, the plane has been a lot of fun, and I hope you enjoy yours as much as I have mine. So, what are you waiting for? Start building!

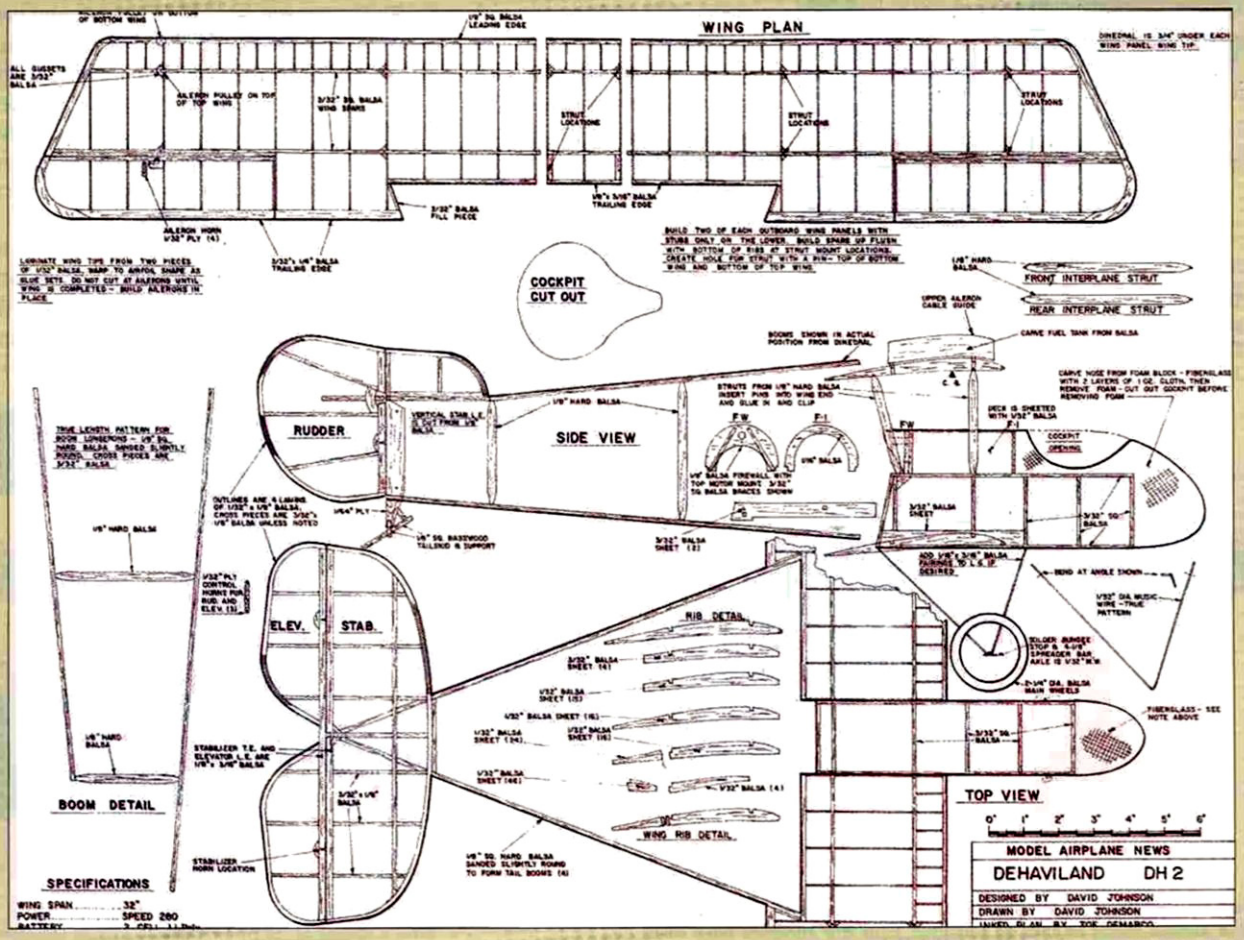
*See the Source Guide on page 151 for manufacturers' contact information.*

### COMMENTS

The DH2 is a unique, nicely detailed WW I aircraft that will draw attention whenever you fly it. It is a traditional stick-and-tissue model that features functional rigging and a pull-pull control system.

click trip MODELAIRPLANENEWS.COM FOR MORE PHOTOS & DETAILED INFO

## FSP 0705A AIRCO DH2




TO ORDER THE FULL-SIZE PLAN, VISIT RCSTORE.COM ONLINE.

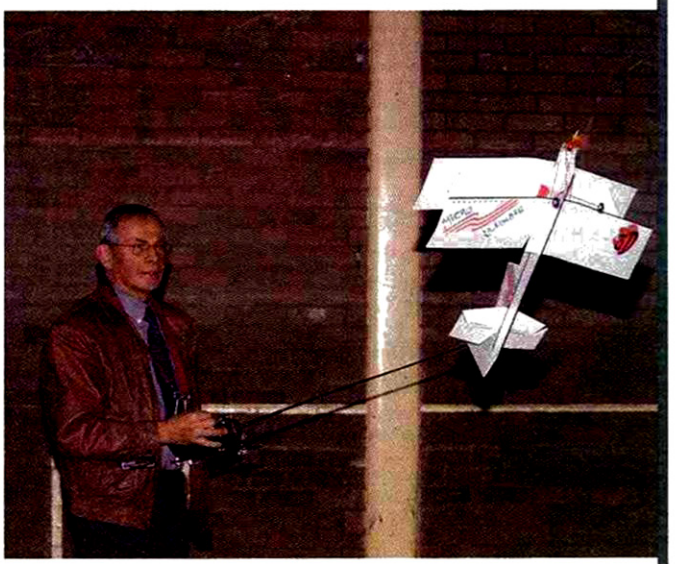
# LRK 195.03 BRUSHLESS MOTOR

## BIG POWER FOR SMALL MODELS

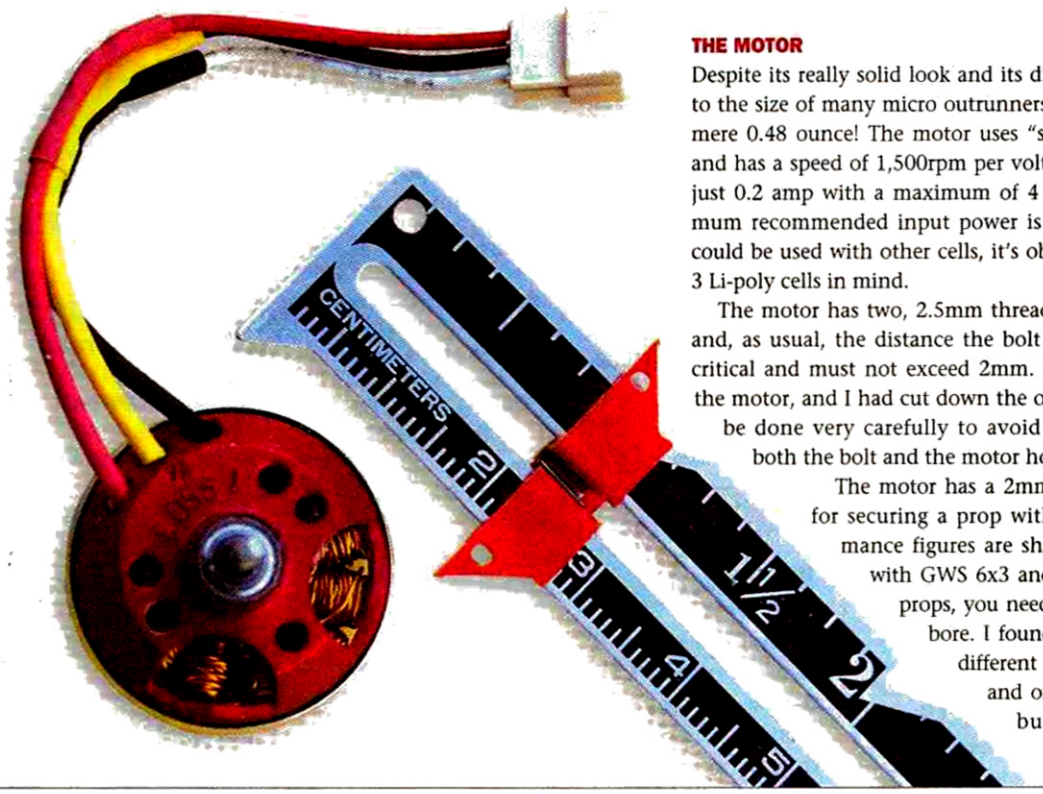
BY JOHN STENNARD > PHOTOS BY JOHN STENNARD

**THE DREAMS OF MICRO MODELERS EVERYWHERE** seem to have come true with the arrival of the ready-to-use LRK 195.03 brushless motor from WES-Technik. This little 12-gram (0.48-ounce!) gem of a motor is accompanied by a 4-gram YG4-BL micro speed control.

Looking at important developments that have given micro indoor flying a performance boost, I would put the arrival of small Li-poly cells first, followed closely by reasonably priced micro-RC gear. Next is foam and carbon-fiber construction, followed by a micro-size brushless motor and speed control. Combined, these advances foretell 2- to 3-ounce planes with full 3D performance! So let's first take a look at the motor and its speed control.



The author flies his micro 3D with the LRK 195.03 motor.




### THE MOTOR

Despite its really solid look and its diameter of 0.92 inch—close to the size of many micro outrunners—the LRK 195.03 weighs a mere 0.48 ounce! The motor uses "star" winding on the stator and has a speed of 1,500rpm per volt. The free-running speed is just 0.2 amp with a maximum of 4 amps if cooled. The maximum recommended input power is 35 watts, and although it could be used with other cells, it's obviously designed with 2 to 3 Li-poly cells in mind.

The motor has two, 2.5mm threaded holes on the front face and, as usual, the distance the bolt extends into the motor is critical and must not exceed 2mm. No bolts are supplied with the motor, and I had cut down the ones I bought. This needs to be done very carefully to avoid damaging the threads on both the bolt and the motor housing.

The motor has a 2mm shaft with two flats on it for securing a prop with grub screws. The performance figures are shown with the motor fitted with GWS 6x3 and 7x3.5 props. To use these props, you need a prop driver with a 2mm bore. I found it quite easy to buy three different types—two that use a collet and one that uses a grub screw—but any of these will add between 3 and 5 grams of

weight. A GWS 6x3 prop weighs 6 grams, and the 7x3.5 weighs 7 grams. So the lightest prop and driver weigh in at 9 grams (0.32 ounce), while the new WES-Technik 6-inch carbon-fiber prop, specifically designed for the LRK motor, weighs only 2 grams (0.07 ounce) and fits perfectly on the 2mm shaft. These props are expensive, but they work extremely well with this motor.

The three motor wires terminate in a micro JST connector that matches the motor connector on the controller. So far, all my flying has been using a 2S1P 310mAh Li-poly pack, and this has given ample power for a 3-ounce model.

### YGE4-BL MICRO SPEED CONTROL

In addition to its incredibly light weight of just 0.14 ounce, the YGE4-BL is very small and can be programmed to suit its application. The controller comes with a micro JST connector for both the receiver and the power supply. I exchanged the power-supply connector for the micro type I use on my battery packs. (Note that some micro JST connectors have the polarity reversed, and these can cause severe damage!)

The first time you use the YG4-BL, the controller can be programmed for timing, brake and cutoff. You can also make changes later by following the same programming procedures.

The timing can be varied from 0 to 30 degrees, the EMK brake can be set from off to 100 percent in five steps, and the cutoff can be set at low-voltage detection off, Ni-Cd/NiMH, or Li-poly mode.

The controller also includes an overload protection that cuts power to the motor at 4.5 amps. There is no reverse-polarity protection, and an incorrect connection will damage the controller. The warranty does not cover this type of damage but does cover malfunction and breakage for 24 months.

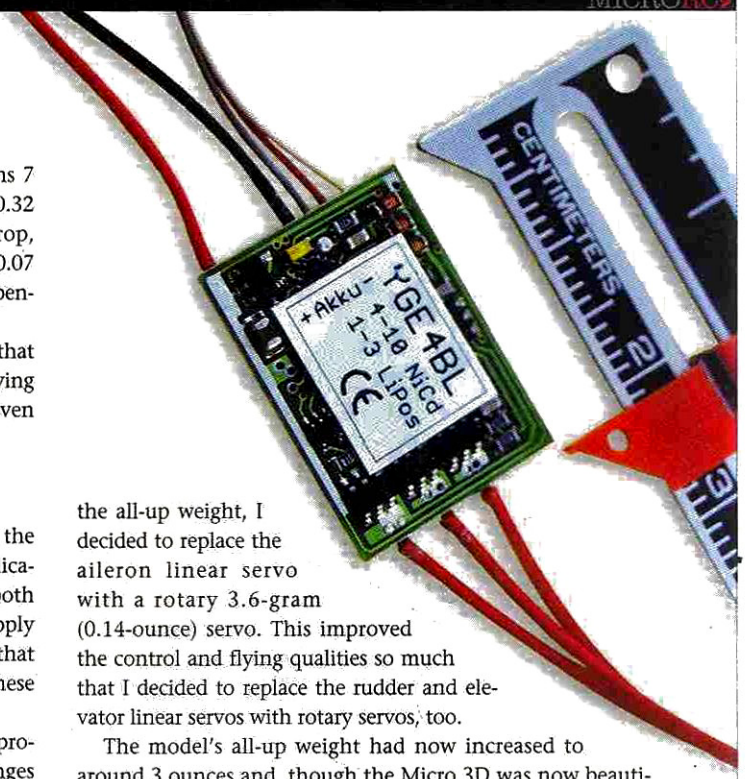
When connected to my JMP receiver, the controller worked perfectly and was very easy to program.

Although you could also use the less expensive Jeti JES 4A with this motor, keep in mind that it weighs about 5 grams more.

### THE REAL TEST

My own-design Micro 3D was the obvious model in which to test-fly the LRK 195.03/YG4-BL combo, so I didn't waste any time in modifying the motor mount to suit the LRK. I had originally used a 2S1P 145mAh Li-poly pack with this model, but these cells have a maximum current draw of 1 amp. A 360mAh Li-poly pack would obviously provide plenty of power, but it's just a bit too large for the model. I found that the ideal cell was the WES-Technik 310mAh. These cells are the same width as the 145mAh ones but are twice as long and can provide up to 3 amps. Although this would prevent the LRK from using its maximum of 4 amps, I was sure there would be enough to fly the Micro 3D.

The Micro 3D is designed for minimum weight and maximum performance, so it uses 2.4-gram WES-Technik linear servos. The motor/controller change added about 0.7 ounce, so the model was bound to fly faster. First flights showed that the motor had plenty of power, but the linear servos—particularly the aileron servo—were struggling to provide fast and accurate control. Although it would further increase the all-up weight, I decided to replace the aileron linear servo with a rotary 3.6-gram (0.14-ounce) servo. This improved the control and flying qualities so much that I decided to replace the rudder and elevator linear servos with rotary servos, too.




The model's all-up weight had now increased to around 3 ounces and, though the Micro 3D was now beautifully smooth to fly, it was a little too fast for my half-basketball-court flying space. Also, conventional aerobatics were really easy to perform smoothly, but the plane lost its 3D agility. If you want to lower the wing loading, the quick solution is to add another wing. I was so impressed with the LRK's performance that I quickly built a 27-inch-wingspan Ultimate biplane. The model was designed right from the start to use the LRK/YGE-4 combo with 3, 3.6-gram servos and either a 2S1P or a 3S1P 310mAh Li-poly pack. The Micro-Ultimate flies extremely well and has shown beyond doubt that micro 3D models are totally practical.

## PERFORMANCE TESTS

| VOLTS | AMPS | WATTS | RPM | THRUST (G/OZ.) |
|---|---|---|---|---|
| **GWS 6x3 PROP** | | | | |
| 7 | 1.8 | 13 | 8,060 | 92/3.2 |
| 11 | 3.3 | 36 | 11,100 | 182/6.5 |
| **GWS 7x3.5 PROP** | | | | |
| 7 | 2.2 | 15 | 7,010 | 103/3.6 |
| 11 | 4 | 44 | 9,570 | 205/7.3 |

*The performance figures show current, power, rpm and thrust for both GWS props. Performance is likely to improve with the WES-Technik carbon-fiber prop. Even at the lowest power level, there is enough thrust to give a 1:1 power-to-weight ratio with a 3-ounce model.*

### A NEW ERA

Building smaller models for motors such as the LRK 195.03 offers a number of advantages, two of which are that they cost a lot less to build, and—if correctly designed—they can be flown in smaller spaces. I think that the introduction of brushless outrunner motors of this size will herald an era of new, exciting models on the indoor scene. I've mentioned only the use for 3D models, but obviously, there are many other applications, such as scale models.

*See the Source Guide on page 151 for manufacturers' contact information.*

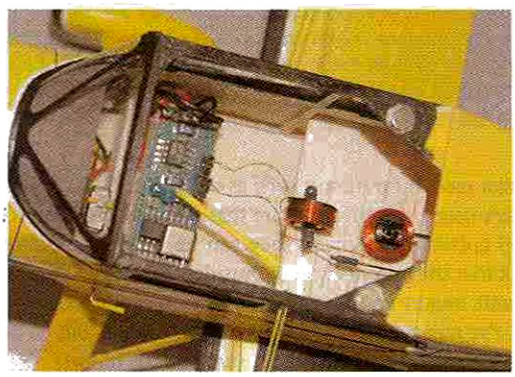

# MICRO WACO SRE A TINY TREASURE

BY SCOTT CHRISTENSEN PHOTOS BY MIKE GRETZ

**THE WACO SRE IS ONE OF MY** favorite airplanes, so I decided to design a little micro model of the gorgeous, full-scale NC1252W aircraft. I used Bob Banka Scale Documentation, two Ray Brandley books—"WACO Aircraft Production" and "WACO Airplanes: Ask Any Pilot"—and *IPMS-USA Quarterly* magazines for documentation and reference.

My model is completely scale in length, wingspan, wheel diameters, strut chords, etc., and even the spinner and wheel pants are exact scale. I molded the spinner out of 0.010-inch-thick plastic sheet, using a basswood male mold that I turned on a lathe. The propeller is functional and is painted to look like the one on the full-scale aircraft. The cowl has induction "scoops" molded out of 0.001-inch-thick plastic sheet and three scale exhausts made out of 0.005-inch lithoplate, complete with rivet detail at their joint lines. The engine-cooling exit is exact scale and is made of 0.005 lithoplate; it's installed in a slightly open position. The cowl also has 32 scale louver vents airbrushed in scale locations.

The tailwheel is exact scale in diameter and has three treads, per scale documentation. I made it out of foam turned on a lathe. The twin-fork tailwheel yoke is scale and has a scale fairing and yoke pin. The top wing's navigation lights are scale in size and shape (green right, red left) and are mounted in scale locations.



**Two remote magnetic actuators and an RFFS-100 receiver provide control.**

The Pitot tube on the top left wing panel is exact scale in length, location, color and detail, and the top-mounted RDF antenna is exact shape, size and color per documentation. It's made of 0.005 lithoplate and has a scale root fairing. The door handle is 3-dimensional and scale in size, shape and location. The windshield is depicted with scale framing, including all radiused corners.

I made the decals by scanning and scaling factory artwork and then printing those images onto clear decal-sheet paper. The main landing-gear struts are scale in extended length with 0.005 lithoplate fairings at the fuselage. The tandem flying-wire sets are in scale locations, airbrushed yellow per documentation (Cadmium Yellow overall with Ebony Black trim and White pinstriping).

The little beast flies just beautifully!

*See the Source Guide on page 151 for manufacturers' contact information.*

## SPECS

**Model:** WACO SRE
**Scale:** 1:29.78
**Wingspan:** 14 in.
**Wing area:** 44.6 sq. in.
**Length:** 11 9/16 in.
**Weight:** 32.4g
**Wing loading:** 3.68 oz./sq. ft.
**No. of channels:** 3 (rudder, elevator, throttle)
**Motor:** M-20LV geared 1:5
**Battery:** 1, 170mAh Li-poly
**Propeller:** modified GWS 5x4.3
**Radio gear:** Dynamics Unlimited RFFS-100 receiver and 2 Bob Selman MiniActs actuators

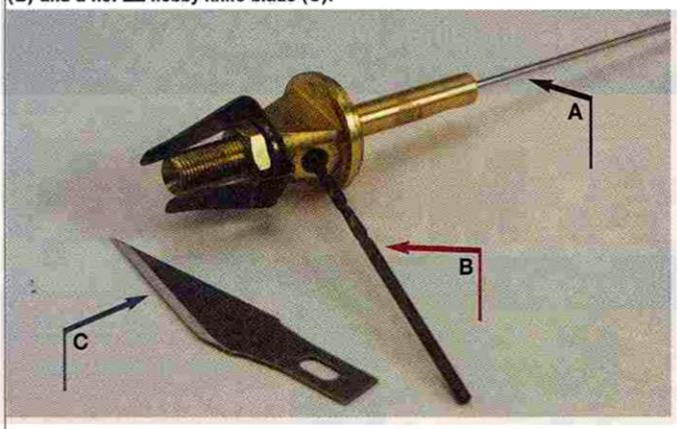
# Throttle up!
## Know your carburetor

BY DAVE GIERKE

**WE CONTINUE TO RECEIVE LETTERS AND EMAIL FROM** readers who have questions concerning all phases of miniature-engine technology. This month, we'll investigate various problems associated with throttle carburetors.

**A disassembled fuel-metering carburetor. Obstructions occur most often in the metering jet (spraybar) housing (arrowed).**

**Below: three tools commonly used to clear obstructions in a metering-jet housing and related passageways are a short length of music wire (A); a twist drill (B) and a no. 11 hobby-knife blade (C).**




### FULL-THROTTLE FAILURE

Andrew Smith emails, "I recently purchased a new Magnum .61 engine and immediately noticed a problem while running it on the break-in stand. It won't run at full throttle; it starves for fuel and quits, no matter how rich the needle valve is set. In desperation, I pressurized the fuel tank with a squeeze-bulb, and this allowed it to operate properly. I have checked the fuel lines, filter and tank for leaks and obstructions but found none. I am using 10-percent nitro, 20-percent synthetic oil fuel from Wildcat, a 12x6 APC propeller and a K&B 1L glow plug. Can you explain why the engine will not run at full throttle?"

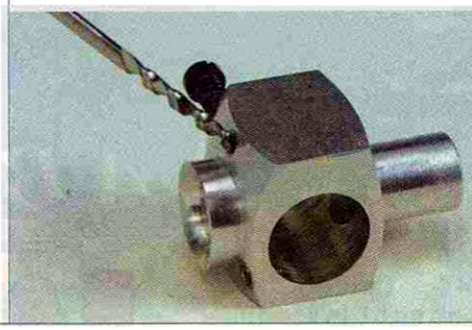
Andrew, I assume that the fuel tank is fitted with an 1/8-inch-o.d. brass tube and medium-size silicone fuel tubing with no splits or pinholes. If these items check out, then the problem might reside within the carburetor itself. Sometimes, a metal burr left over from the manufacturing process becomes lodged within a passageway or orifice, restricting fuel flow; this might be what happened, since the engine ran normally when you pressurized the tank. You'll need to carefully disassemble the carburetor for further inspection—a relatively simple task, provided you have the proper tools. If you are hesitant about tackling this job, ask an experienced club member or hobby-shop employee to help. You can usually detect obstructions by observing and poking about the fuel passageways. If you find one, remove it with the tip of a hobby knife or a drill that matches the various orifice sizes.

### THE IDLE RICH

David Lamonte of Atlanta, GA, writes, "My O.S. Max .25 LA engine had been running great in stock form using a Master Airscrew 9x6 propeller and Red Max 10-percent nitromethane fuel. The combination produced 10,100rpm on the ground, but the engine seemed to be running hot. I thought the muffler might be producing too much backpressure, so I drilled out the exhaust outlet tube to 7/32 inch. The engine didn't seem to be making any more noise, but it gained almost 1,000rpm (11,000)! Now for the problem: for some reason, the idle and midrange mixture are too rich—even with the airbleed screw opened all the way. Any idea what's going on here? If so, how do I fix it?"

David, reducing the engine's backpressure by drilling out the muffler outlet allows more fuel/air mixture to pass through the engine at any given throttle setting; this provides enhanced torque and power but causes the carburetor to produce a rich idle mixture. Less backpressure will also allow the engine to run cooler, exaggerating the rich idle condition. Normally, this enriched mixture can be corrected by backing off on the air-bleed screw, allowing more air to enter at idle.

Because of your new situation, you'll need to enlarge the air-bleed hole. You can do this by drilling incrementally larger holes (using number drills) and then running the engine to check the idle and midrange. Avoid making the air-bleed hole any larger than necessary to produce the desired results; bleeding more air into the engine at idle will diminish the fuel draw by narrowing the pressure differential between the tank (muffler pressure) and the carburetor



**Enlarging the air-bleed hole within the housing of a disassembled air-bleed carb. The housing should be aligned and clamped in a smooth-jaw vise; a drill press is recommended to ensure accurate drilling.**

The fuel-metering carburetor on the Tower .61 engine. Note the idle-adjustment needle valve (arrowed).

(crankcase suction). Low fuel draw often produces erratic engine operation or an occasional flameout during throttled maneuvers. Your engine might not sound any louder to you, but a sound-level meter would probably indicate otherwise.

I hope that your flying-site neighbors are a forgiving lot!

## MIDRANGE BLUES

Dan Paulson writes, "I have an almost-new GMS .61 ringed engine with a remote needle valve. The engine idles perfectly and runs great at full throttle; it's the midrange throttling that's giving me fits! No matter how I adjust the needle valves or how carefully I throttle up from idle, the engine spits raw fuel from the carburetor and muffler before it stops running. I've been using an APC 11x8 sport propeller, 10-percent-nitro fuel from Cooper and a Fox long-reach glow plug. Because I can't get the engine to run properly on the break-in bench, I haven't thought about trying it in an airplane. So far, the engine has been run for almost three hours. Help!"

Dan, ringed engines often require considerable break-in time before they will idle and transition to wide-open throttle (WOT) properly. In your case, three hours should be sufficient time to seat the piston ring. Several adjustments will help to solve the problem, but first, let's review why many 2-stroke engines have difficulty throttling through the midrange.

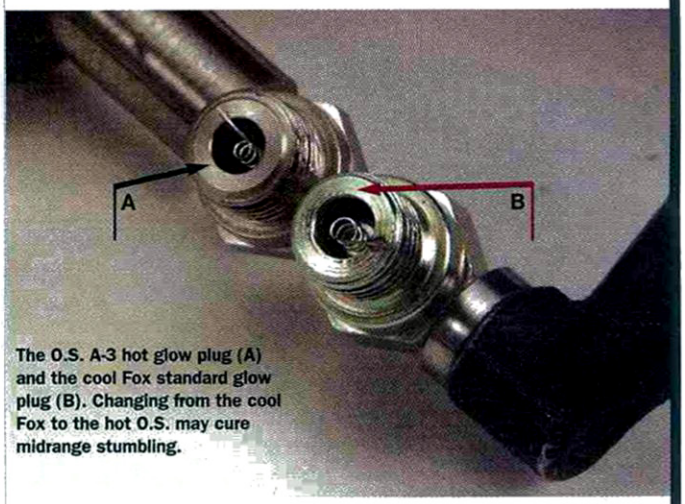
Unfortunately, the air/fuel mixture ratio must change between WOT and idle to maintain satisfactory combustion conditions within the engine's cylinder. This is a difficult task for a relatively simple fuel-metering type of carburetor. Here are the mixture ratio criteria:

**›WOT.** At WOT, the mixture ratio must be set quite rich to provide maximum engine power; the extra fuel lubricant also helps to carry away excess heat.

**›Midrange.** At about ½ throttle, the engine begins misfiring every other revolution of the crankshaft; known as 4-cycling, this occurs when exhaust gases contaminate the fresh air/fuel mixture within the crankcase. The important thing to remember, however, is this: if the engine fires half as often, it needs only half as much fuel; the mixture must be leaned at midrange to remain within the limits of combustibility.

**›Idle.** At idle, the air/fuel mixture ratio again needs to be changed. With the throttle barrel almost closed, little air enters the engine, leaving the few available oxygen molecules dispersed among the backflow of non-combustible exhaust gases. To successfully "hook up" with these oxygen molecules, extra fuel molecules must be made available by richening the mixture. See the illustration below for a depiction of a 2-stroke engine's mixture-ratio curve.

All fuel-metering 2-needle carburetors are ill-equipped to lean




The O.S. A-3 hot glow plug (A) and the cool Fox standard glow plug (B). Changing from the cool Fox to the hot O.S. may cure midrange stumbling.

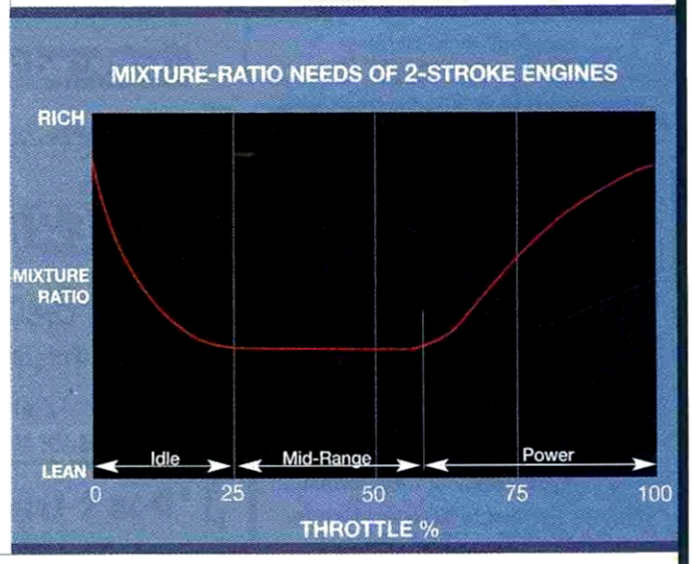
out the midrange mixture; most midrange problems are of the "too-rich" variety. Here are some helpful remedies:

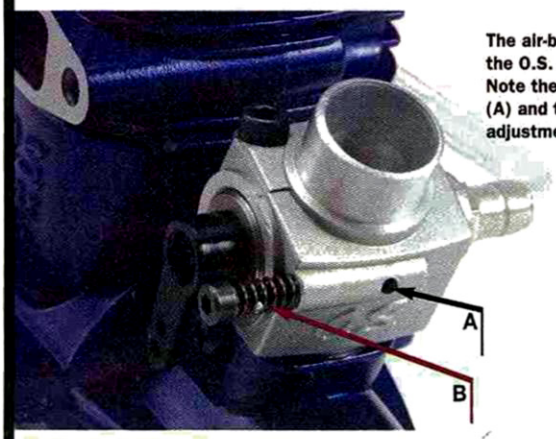
**›Glow plug.** Change to a hotter, idle-bar variety. This adjustment treats the effect rather than the cause, but the idle bar helps deflect some of the raw fuel away from the hot wire element.

**›Needle valve.** Setting the idle and high-speed needle valve slightly leaner than normal will help to lean the midrange; however, always allow a minimum setback (100rpm) from the peak rpm, using the high-speed needle. Never risk a lean, hot, WOT run.

**›Modified needle valve.** In extreme cases, I have lengthened the taper on the main needle valve, causing it to exit from the metering jet (spraybar) more slowly and, thus, leaning the midrange mixture. Performed correctly, this requires a lathe and grinding equipment.

**›Fuel and lubricant.** Change to a higher nitromethane-content fuel, and slightly lower the oil content. Additional nitro helps to keep the glow-plug element hot; less lubricant provides better access for the fuel/oxygen molecules. If you are using 10-percent nitro fuel with 20-percent synthetic lube, try 15-percent nitro and 17-percent oil. I like to add some castor oil to the lube blend—in this case, ⅓ castor to ⅔ synthetic.






**The air-bleed carb on the O.S. LA .65 engine. Note the air-bleed hole (A) and the air-bleed adjustment screw (B).**

**The remote primary needle valve on the air-bleed-carburetor-equipped O.S. LA .65 engine.**

## SAGGING ENGINE

An email from Harold Barnes says, "I have a K&B .40 that acts very strangely. The engine starts, idles and transitions to maximum rpm with no difficulty. More often than not, however, it quits on the take-off run. Also, if I run it at full throttle while holding onto the model, it sags after about 20 seconds. I have tried replacing the glow plug, cleaning the carburetor, replacing the fuel lines and adjusting the needle valve every which way; nothing seems to help. I'm using a K&B idle-bar glow plug and Sig 10-percent fuel (20-percent oil). I have noticed dark brown globs of oil moving from the muffler to the tank. If I disconnect the pressure line and readjust the needle valve, the engine seems to run without sagging, but then it quits during maneuvers. If I richen up the needle [valve], I can get through the whole tank, but the engine rpm surge at full throttle. No one else in our club has had a similar problem. Any ideas? Thanks for your informative column."

Harold, it sounds like waste oil in the exhaust is plugging your muffler pressure line and causing the engine to lean out after a bit of running. The same thing happens if you clamp off the pressure line; a partial vacuum gradually forms in the tank and disrupts fuel delivery to the carburetor. The engine will operate without muffler pressure, but it sounds as though the engine's fuel draw is marginal; you need the muffler's pressure boost. Several conditions can be responsible for the pressure-line condition:

- Excess castor oil in the fuel.
- Undersize pressure line from the muffler to the tank.
- Undersize hole in the muffler's pressure fitting.

If you're running the engine quite rich with a castor-oil-based fuel, the exhaust residue is probably collecting in the muffler's expansion chamber, where the pressure fitting is located. If a glob of this goo makes its way into the pressure line, it will act like a plug. If you drill the pressure fitting to at least 1/16 inch and use medium-size silicon fuel tubing, the problem should disappear.

## AIR-BLEED ADJUSTMENT

Dennis Mills writes, "I recently bought an old O.S. Max .35 RC engine at a garage sale for just $6. It appears to have all of its parts—including a muffler—and looks like new. Unfortunately, it didn't come with instructions. I'm new to modeling and want to use the engine in a trainer-type RC model. A hobby-shop owner told me that the engine has an air-bleed carburetor, but he didn't know how to adjust it. Last week, I started the engine on a test stand, and it ran very well, but it stalled when I tried to make it idle. Can you explain how to adjust the carburetor?"

Dennis, congratulations on obtaining a nice engine at a great price! If the engine is new, you'll need to break it in before you try to adjust the idle. Although you didn't mention the exact model (O.S. has produced many), I suspect that it has a ring-less (lapped) piston with a nickel-plated brass cylinder known as ABN (aluminum alloy piston, brass cylinder with nickel plating). To break in this type of engine, you should run it for two minutes at a time at slightly less than maximum rpm (use a 10x5 propeller) for a total of about 30 minutes. If you don't have a tachometer, you should get one; it's a good investment and will help you precisely determine the engine's speed.

Besides break-in, many other variables can affect an engine's idle, including the tank position, type of glow plug, and fuel and propeller size. There are a few methods for determining whether the carburetor is adjusted properly; simply keeping the engine running after being throttled back is a good starting point! A good idle speed for an air-bleed carburetor is about 2,500rpm with the tank half filled; here's where having a tachometer is important. When the engine is idling, if it speeds up and quits, it's too lean; you need to richen the mixture. Air-bleed carburetors have a hole drilled somewhere on the carb body, usually on the front. By turning the screw clockwise, you can close the air-bleed hole, thereby richening the mixture. If, however, the engine gradually slows down and quits when the throttle barrel is closed to the idle position, the mixture is too rich. In this case, turn the air-bleed screw counterclockwise, admitting more air and leaning the mixture.

When your engine is mounted in an airplane, you can perform a simple "tip test" to determine whether the idle mixture is correct. With the tank half full and the engine idling, lower the model's tail; if the engine quits, the idle mixture is too lean. If the engine idle improves when the tail is lowered, the mixture is too rich and should be adjusted as previously described. This test will work reliably only with air-bleed-type carburetors. Fuel-mixture carburetors (those with two needle valves) have too much fuel draw to be affected by tipping. Of course, the other good method for checking the idle mixture is to fly the model. If the engine idles well on taxi but quits when the tank is almost empty (during landing), the mixture should be richened slightly. Good luck with your first RC airplane!


## Dave Platt Models
### Black Art Series: Understanding & Using Epoxy Paints
#### Finishing school

Dave Platt's Black Art Series of videos is a treasure-trove of scale-modeling knowledge. If you want to learn about designing, building, painting, or detailing a scale model, these are among the best tools to own.

The newest addition to the collection is "Understanding & Using Epoxy Paints," and it presents Dave's techniques for properly mixing and applying a 2-part, epoxy-based finish. But the DVD goes into much more detail than just that.

In the DVD, Dave introduces a new brand of paint called Klass Kote, which has replaced the discontinued Pettit HobbyPoxy and K&B SuperPoxy paints. Klass Kote offers primers, several paint colors, catalysts and thinners/reducers that can be used with any of the older brands' colors, catalysts and thinners. Dave has based many of his long-established painting and finishing techniques on 2-part, epoxy-based paints, and it's great to once again have a paint that's readily available to scale modelers.

Dave thoroughly dissects the subject of paint and then moves on to describe the various steps as he paints the tail section of his newest project. His credo is that a fair paint job on a superior model surface looks much better than a superior paint job on a fair surface. He means that a good paint job results when you prepare your model well before you paint it; the surfaces must be smooth and blemish-free. As always, he finishes the tail surfaces with two coats of Sig polyester resin and lightweight fiberglass cloth sanded smooth between the coats. After the primer has been applied and has dried, Dave sands it with 80-grit paper and exposes any tiny blemishes in the finish.

After Dave has brought the primed tail surfaces to an acceptable finish, he applies the first coat of paint, which he says is your last chance to make everything perfect. It's the time to fill in any remaining imperfections and sand the surface smooth. Additional coats of paint now won't improve the finish; what you see is what you'll get.

Like an artist working on canvas, Dave produces model masterpieces that are finished with 2-part epoxy paint; with his new DVD, you can watch and learn from the master.

Each video runs approximately two hours. They're available on DVD or VHS; the first video ordered is $34.95; additional videos are $30 each. (Note: these DVDs may not work on some older DVD players.) *—Gerry Yarrish*

**Dave Platt Models** (321) 724-2144; daveplattmodels.com.


## Specialty Press
### "Air Combat Legends" and "The Focke-Wulf Fw 190 in North Africa"
#### Scale treasures

Two new books from Specialty Press belong on every scale builder's bookshelf: "Air Combat Legends" and "The Focke-Wulf Fw190 in North Africa"; they are excellent references for scale enthusiasts. Both contain outstanding illustrations of various color schemes and hundreds of period photos, along with many full-color 3-view and side profiles.

"Air Combat Legends" deals with mortal enemies in the skies over wartime Europe—the British Spitfire/Seafire and the German Bf 109. It tracks the history and development of both planes and examines the different variations, missions and cockpits, as well as the weapons they carried and the air battles they fought. Each aircraft's exhaustive analysis is supported with great photos and illustrations.

This 256-page hardbound book is edited by David Donald, one of Europe's most respected aviation writers. It contains more than 900 photos/illustrations and is available for only $34.95.

"The Focke-Wulf Fw 190 in North Africa," by Andrew Arthy and Morten Jessen, gives a day-to-day account of the airwar over Tunisia and Algeria from the perspective of Fw 190 pilots, much of it taken from diaries and first-hand accounts of both German and Allied pilots. The appendix includes complete loss and victory lists, along with some nice color illustrations of camouflage and markings of various Fw 190s that served in North Africa. After three years of in-depth research, the authors formulated an intriguing, historical story that I found enjoyable to read. This 176-page, hardbound book has more than 150 photos, color artworks, maps and diagrams. It costs $54.95. *—John Reid*

**Specialty Press** (800) 895-4585; specialtypress.com.

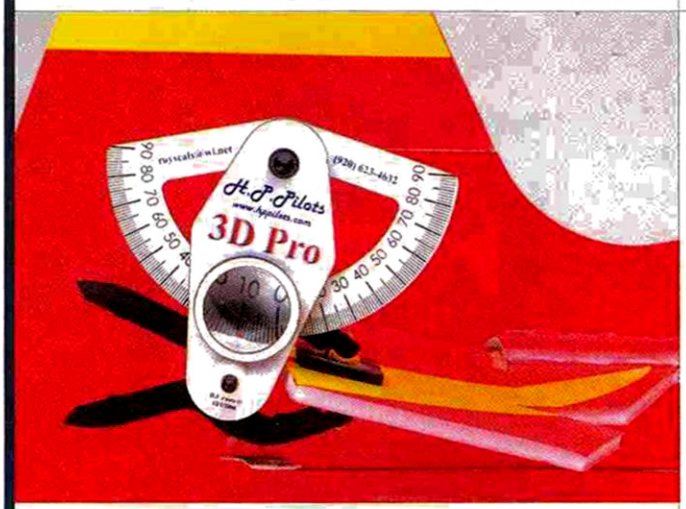
## >Battery Bunker
## Li-Poly Bunkers
### Safety first

We've all heard the reports that Li-poly batteries can vent and start a fire if they're improperly charged. Although this is highly unlikely as long as you take proper precautions and monitor the charging procedure, here's a product that can provide extra peace of mind. The Battery Bunker is a stoneware container that houses Li-poly batteries as they're being charged, protecting your property from any harm just in case something goes wrong. Think of it as Li-poly battery-charging insurance!

This stoneware container can withstand more than 2,000 degrees F and is strong enough to safely contain the venting of an improperly charged Li-poly battery. The lid is designed to lock into place while still providing an exit hole for the charging lead wire. If the worst-case scenario should happen, the Battery Bunker will contain any fire that erupts within the confines of the container. Whether I charge my Li-polys at home or at the flying field, I now always enclose them in a Battery Bunker just for the added safety.

Available in two sizes, the Battery Bunker accommodates all but the largest Li-polys. The small Bunker has a 3.25-inch opening and is 5 inches deep. The large Bunker has a 3-inch opening, is 8 inches deep and can accommodate a 7-inch-long battery. The Battery Bunkers are handmade, so they will vary slightly in size. They cost $15 to $25 each. *—John Reid*

**Battery Bunker** (760) 247-6980; batterybunker.net.



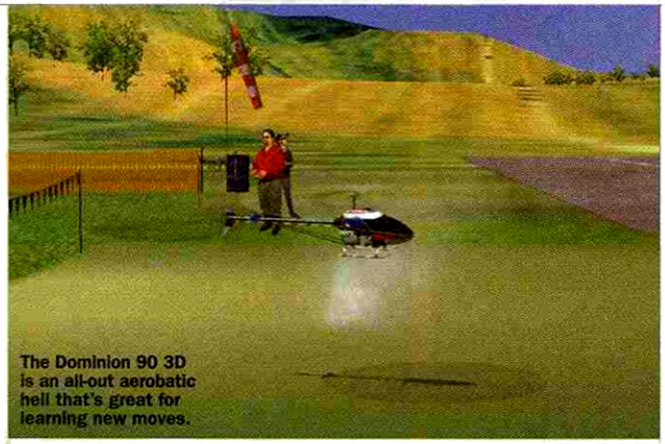

## H.P. Pilots
## 3D Pro Deflection Meter
### Control-throw precision

The instructions in almost every kit available today state the recommended control throws for that particular model. Manufacturers arrive at these numbers after extensive prototype testing, and these control throws will give you just the right amount of control without being overly sensitive. On the first few flights, most pilots (myself included!) should always set the control throws to the manufacturer's recommendations. Later, you can adjust them to your flying style. One of the easiest ways Later, you can adjust them to your flying style. One of the easiest ways to measure control throws is by using the 3D Pro deflection meter from H.P. Pilots.

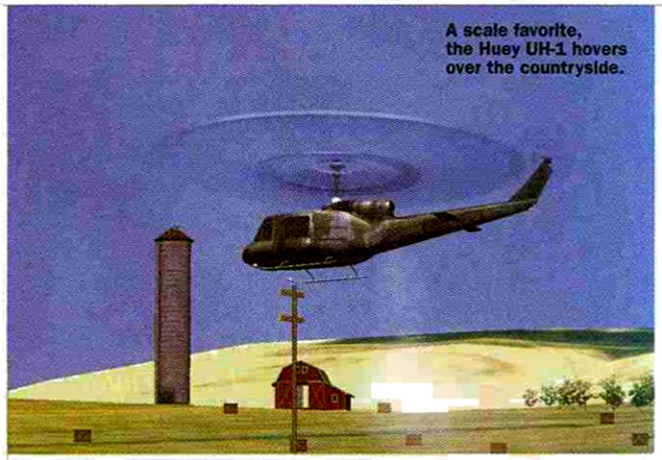
Clip this little device to your control surface and adjust the gauge until it reaches zero, then move the control surface and read the degrees of movement through the magnified window. Its lightweight construction allows the 3D Pro to be used even on a small park flyer. The solidly gripping clamp maintains a firm hold on the control surfaces, but the cushioned clamp pads won't harm your plane. The body of the gauge pivots around its connection to the clamp and allows you to use the 3D Pro for both right and left control surfaces. The easy-to-read magnified window provides easy viewing of the protractor gauge that is divided into 1-degree intervals. It's a nice improvement over the older models that had only a thin pointer.

I found the 3D Pro very easy to use, even when the control throws are given in inches rather than degrees. The accompanying conversion chart converts degrees to inches or millimeters. Just measure the widest point on the control surface, clip the 3D Pro there, and measure the degree of movement. Cross-index the angle degree with the control-surface measurement, and you'll have the control throws in inches or millimeters. I found that the 3D Pro works well on planes of all sizes, and it's one tool that I use for every plane I assemble. It costs $32 (plus S&H). *—John Reid*

**H.P. Pilots** (920) 623-4632; hppilots.com.



The Dominion 90 3D is an all-out aerobatic heli that's great for learning new moves.



A scale favorite, the Huey UH-1 hovers over the countryside.

The Impala Trainer duplicates a .30-size heli and is perfect for novice pilots.

My favorite scale chopper is the Army H-13; it's just too cool.

## >Great Planes Model Distributors
## RealFlight G3
## A no-compromise flight simulator

In the March 2005 issue of *Model Airplane News*, I had the opportunity to review the latest release of Great Planes' RealFlight RC flight simulator, Generation 3 (G3). Advertised as a fixed-wing and helicopter flight simulator, early versions of G3 were shipped without the programming for helicopters. This was a big letdown for many people, but Knife Edge Software (the brains behind RealFlight) wanted to make certain that they got the heli programming right. If you have an early release of G3, you can contact Great Planes to request the free heli update disc, or you can download the update from the RealFlight website at realflight.com/helis.html.

After spending many hours flying all of the available virtual choppers (14 of them in all), I came away very impressed with the simulator. Though some of the helis are carryovers from RealFlight G2, there are also a number of new models. Rest assured; the helis fly a whole lot better and—most important—very realistically. The performance power of RealPhysics 3D is very apparent. It's also quite obvious that RealFlight did extensive flight-testing using topnotch heli pros such as Todd Bennett, Pete Niotis and others. These guys are 3D gurus who helped design the Dominion 90 3D. This flagship heli is capable of 3D moves such as the Tic Toc, pirouetting flips, the snake, aerobatic autorotations and even death spirals.

If there is a maneuver that you can't do but would like to learn, simply access the Virtual Flight Instructor and be taught by the pro's. Not only is the maneuver explained, but a transmitter with real-time stick movements is also displayed onscreen while the maneuver is being performed. It's like looking over the pilot's shoulder while he gives you a private lesson!

If you're more interested in scale than in aerobatics, G3 has you covered with several beautiful choppers. The popular Jet Ranger is available in two versions: a standard, 2-blade head and a scale, flybarless 2-blade head. The flight characteristics are very different between the two, so you've been warned! Other scale machines include a Bell 222, an Army H-13 and Huey UH-1, a Schweizer 300 and an Ecureuil (a popular European civilian heli).

Of course, novice pilots can fly any of G3's helis, but it's best to start out with the Impala Trainer. This model replicates a .30-size heli with stable, soft control responses—perfect for learning heli flight.

As you can see, RealFlight G3 has something for everyone, from hardcore 3D pilots to scale fanatics and fledgling pilots. The models look and feel great, and you can customize each one through the AccuModel aircraft editor. Now there's no reason not to hone your flight skills and learn new tricks. —*Rick Bell*

**AT MODEL AIRPLANE NEWS,** we not only tell you what's new, but we also try it out first so we can bring you mini-reviews of the stuff we like best. Manufacturers frequently send us their latest support equipment, and if we think a product is good—something special that will make your modeling experiences a little easier or just plain more fun—we'll let you know here. From retracts and hinges to glow starters and videotapes, look for it in "Product Watch."

# CLASSIFIEDS

**RATES: non-commercial—25 cents per word (no commercial ads of any kind accepted at this rate); commercial—50 cents per word (applies to retailers, manufacturers, etc.); count all initials, numbers, name and address, city, state, zip code and phone number. All ads must be paid for in advance.** To run your ad for more than one month, multiply your payment by the number of months you want it to run. **Deadline: the 10th day of the month, 3 months in advance, e.g., *January 10 for the April issue.*** We don't furnish box numbers, and it isn't our policy to send tear sheets. **Please make all checks payable to: Air Age Inc. SEND AD AND PAYMENT TO: CLASSIFIED ADS, Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606 USA, or call (203) 431-9000.**

## BUSINESS

**MODEL AIRPLANE SCHOOL.** At Hobbies Aloft RC Flight School, your training will consist of more than 100 hands-on landings per day until you solo—guaranteed! Ray Smith, your personal trainer, uses "kinesthetic instruction" (no buddy boxes) to guide you down to land until you are able to execute the landing sequence by yourself. Typical students require 4 to 6 days of training to solo, and then their RC flying fun really begins! We fly year-round along the beautiful California coast near Monterey. Call toll-free (888) 700-4421 to make a reservation, and visit our website: hobbiesaloft.com. [4/06]

**1ST U.S. R/C FLIGHT SCHOOL.** Accelerated 5-day courses. More than 1,000 students trained; 98% solo success rate; (715) 524-2985; rcflightschool.com. [6/06]

**AG-AIRCRAFT PLANS.** Pawnee, Agwagon, Pawnee Brave, Transavia Airtruk/Skyfarmer, Fletcher FU-24, Cropmaster and more. Hardware paks, colour photo paks, free documentation. Catalog/price list: $5 (U.S.); VISA/MC. New Zealand Aero Products, 34 Ward Parade, Stirling Point, Bluff, New Zealand. Mobile: +6427-427-1843. [5/05]

**WANTED: UNIMAT AND WATCHMAKER LATHES;** early microprocessors: KIMs; SYMs; AIMs; SOLs; robots and Atmos clocks. John Rawley, 1923 Susquehanna, Abington, PA 19001; (215) 884-9220; johnR750@aol.com. [6/05]

**GWS ACCESSORIES, PLANS & PARTS.** Low prices, fast and friendly service and a great selection of your favorite GWS airplanes and accessories. Visit www.microflyer.com [11/05]

**BOB'S AIRCRAFT DOCUMENTATION, NEW 2005/6.** World's largest commercial collection of aircraft photos (400,000) and 3-view line drawings (39,000). 272-page catalog—$10; Canada, Mexico, Alaska, Hawaii & Puerto Rico—$12; international—$20 (includes air postage). 3114 Yukon Ave., Costa Mesa, CA 92626; (714) 979-8058; bobsairdoc.com. [5/05]

**R/C FLIGHT INSTRUCTION** in North Central Georgia Mountains "Blairsville"; (706) 745-8667. [9/05]

**RARE EARTH MAGNETS.** Perfect for hatches, etc. SUPER STRONG ¼ x ⅛-in. disc—$1 ea.; ⅜ x ⅛-in. disc—$1.25 ea.; plus $1 shipping & handling in U.S. Send SASE for more information and quantity pricing. Colorado residents add 2.9% state tax. Send check or money order to North Creek, P.O. Box 61, Mead, CO 80542-0061. [10/05]

**TURN YOUR AIRPLANE AND ROCKET DESIGNS INTO CASH!** We laser-cut your designs for small or large production requirements. Please visit laserimageworks.com. [5/05]

## HOBBYIST

**RYOBI CONVERSIONS.** We are the oldest, the best and the least expensive. We have all your conversion needs for complete engines, conversion kits and our 360-degree muffler. For free conversion instructions and catalog, send SASE to Jag Engines, 16073 Muscatel, Hesperia CA 92345; (760) 244-7270; see our website at jagengines.com. (1/06)

**FOR SALE:** Top Flite 1-in. Scale P-51 Control Line. Also, Scale Master JN-40 "Jenny" 44-in. Control Line. Both kits in original boxes. (618) 566-2757. [6/05]

**R/C VIDEO:** featuring aerial views from the pilot's seat; ⅓-scale J-3 Cub, ⅕ Beech Staggerwing and more! 90 minutes; VHS tape—$7.50; DVD-R—$10. Send check to Raymond Keel, 1200 E. Davis St., Ste. 115, Box 192, Mesquite, TX 75149. [4/05]

**USED ENGINES WANTED:** pre-1970 preferred. T. Crouss, 100 Smyrna, West Springfield, MA 01089-1706; (413) 732-3859. [10/05]

**VINCE MILLER PLANS AVAILABLE AGAIN.** Send $2 for brochure to Calvin's Classic Plans, 3704 Drumm Ave., Independence, MO 64055. [9/05]

**FREE EMAIL WARBIRD NEWSLETTER SAMPLE—** WW I, WW II, RC fighters & bombers. Send request to gyarrish@yahoo.com. Full color; annual subscription $5. [10/05]

**WANTED:** MODEL AIRPLANE ENGINES. G.Risso, P.O. Box 390221, Kailua Kona, HI 96739; (808) 326-9023; rissogool@hawaii.rr.com. [7/06]

**FOR SALE.** Multiplex Royal mc Expert transmitter with 2 receivers (CH 28 and CH 14) and appropriate RF modules, 3 servos and thick factory manual. Most reasonable offer. Ernest DeBardeleben, Orlando, FL; (407) 281-7340. [6/05]

# SOURCEGUIDE

**A&A Engineering** (714) 952-2114; a-aengineering.com.
**A.M.R. Productions** (609) 971-8338.
**ABC Radio Control Hobbies** (956) 722-2845.
**Ace Hobby Distributors** (949) 833-0088; acehobby.com.
**Aces of Iron;** dist. by Perfect Pilots (269) 695-2518; perfectpilots.com.
**Aero-Model Inc.** (480) 963-5565; aero-model.com.
**Aerospace Composite Products;** acp-composites.com.
**AeroWorks** (303) 366-4205; aero-works.net.
**AirBorne Models** (925) 371-0922; airborne-models.com.
**Airfoil Aviation Inc.** (217) 938-4473; airfoilaviation.com.
**Airplane Factory Inc.** (800) 264-7840.
**Airtronics** (714) 978-1895; airtronics.net.
**America's Hobby Center;** ahc1931.com.
**APC Props;** dist. by Landing Products (530) 661-0399; apcprop.com.
**Apogee;** dist. by Prop Shop Hobbies (586) 757-7160; prop-shop.com.
**AstroFlight Inc.** (310) 821-6242; astroflight.com.
**Autogyro Co. of Arizona** (602) 582-9428.
**Axi;** dist. by Hobby Lobby and Northeast Sailplane Products.
**Balsa USA** (906) 863-6421; balsausa.com.
**Batteries America** (608) 831-3443; batteriesamerica.com.
**Bigairplanes.com** (860) 738-4605.
**Bluejay Airplane Kits** (308) 276-2322; bridiairplanes.com.
**BME Engines** (604) 638-3119; bmeengine.com.
**Bob Selman Designs** (417) 358-9521; bsdmicrorc.com.
**Bob Smith Industries** (805) 466-1717; bsiadhesives.com.
**Bruckner Hobbies** (800) 288-8185; brucknerhobbies.com.
**Brushless Motors Inc.** (386) 985-0288; brushless-motor.com.
**Byron Originals** (712) 364-3165; byronfuels.com.
**Cactus Aviation** (520) 721-0087; cactusaviation.com.
**CAF 96th Squadron;** caf96th.com.
**Cal-Grafx;** cal-grafx.com.
**CAModel USA** (786) 999-6253; camodel.com.ar.
**Carden Aircraft** (828) 697-7177.
**Carl Goldberg Products** (678) 450-0085; carlgoldbergproducts.com.
**Castle Creations** (785) 883-4519; castlecreations.com.
**Cedar Hobbies** (832) 202-7343; cedarhobbies.com.
**Century Helicopter Products** (800) 686-8588; centuryheli.com.
**Cermark** (562) 906-0808; cermark.com.
**Champion Model Products** (909) 599-3348.
**Chase-Durer** (800) 544-4365; chase-durer.com.
**CheapBatteryPacks.com** (503) 356-5567.
**Chief Aircraft Inc.** (877) 219-4489; chiefaircraft.com.
**Choppahedz LLC** (310) 787-9909; choppahedz.com.
**Cirrus;** dist. by Global Hobby.
**Cleveland Model & Supply Co.** (317) 257-7878.
**Communications Specialists Inc.** (800) 854-0547; com-spec.com.
**Composite ARF Co. Ltd.;** composite-arf.com.
**D&L Designs** (520) 887-0771.
**Dave Brown Products** (513) 738-1576; dbproducts.com.
**Dave Patrick Models** (815) 457-3128; davepatrickmodels.com.
**Debece Co.** (615) 238-4884; debece.net.
**Desert Aircraft** (520) 722-0607; desertaircraft.com.
**Didel;** didel.com.
**Diversity Model Aircraft** (858) 693-8188.
**Doppeldecker Corp.** (800) 777-2090; 2decker.com.
**Du-Bro Products** (800) 848-9411; dubro.com.
**Dumas** (520) 623-3742.
**Duralite Batteries** (877) 744-3685; duralitebatteries.com.
**Dynamics Unlimited** (727) 559-0539; slofly.com.
**E Cubed R/C** (937) 849-0418; azarr.com.
**Eagle Tree Systems** (888) 432-4744; eagletreesystems.com.
**EaglePicher Kokam Ltd.;** dist. by FMA Direct.
**Eddie A. Aircraft Original Scale Classics** (201) 337-5075.
**E-flite;** dist. by Horizon Hobby.
**ElectriFly;** dist. by Great Planes; electrifly.com.
**ElectroDynamics** (734) 422-5420.
**Empire Hobby** (480) 982-0909; empirerc.com.
**Estes-Cox Corp.** (719) 372-6565; coxmodels.com.
**Evergreen Scale Models Inc.** (425) 402-4918; evergreenscalemodels.com.
**Evolution Gas Engines;** dist. by Horizon Hobby.
**Experimental Aircraft Models** (800) 297-1707.
**F&M Enterprises** (817) 279-8045; stits.com.
**Falcon Trading Co.** (800) 591-2896; falcon-trading.com.
**Fiberglass Specialties** (810) 677-0213.
**Flight Line Toys** (417) 883-2510.
**FMA Direct** (800) 343-2934; fmadirect.com.
**FPF Inc.** (877) FLY-FOAM; fpf-inc.com.
**Fuji Engines;** dist. by Great Planes; fujiengines.com.
**Futaba Corp. of America;** dist. by Great Planes; futaba-rc.com.
**G and P Sales** (707) 965-1216.
**Georgia Aircraft Modelers Assoc.** (478) 328-2689; gama.rcclubs.com.
**Glenn Torrance Models** (919) 643-1001; gtmodels.
**Global Hobby Distributors** (714) 963-0329; globalhobby.com.
**Great Northern Models** (905) 320-7979.
**Great Planes Model Distributors** (217) 398-6300; (800) 682-8948; greatplanes.com.
**Great Planes Model Mfg.;** dist. by Great Planes.
**GWS USA** (909) 594-4979; gws.com.tw.
**Hacker Brushless Motors** (480) 726-7519; hackerbrushless.com.
**Hangar 9;** dist. by Horizon Hobby.
**Hayes Products** (714) 554-0531.
**Henry Pasquet** (573) 322-5747.
**Hirobo;** dist. by MRC.
**Hitec RCD Inc.** (858) 748-6948; hitecrcd.com.
**Hobbico;** dist. by Great Planes; hobbico.com.
**Hobbies & Helis Intl.** (610) 282-4811.
**Hobby Group Inc.** (562) 240-2134; nwhobbyexpo.com.
**Hobby Lobby Intl.** (615) 373-1444; hobby-lobby.com.
**Hobby People;** dist. by Global Hobby (800) 854-8471; hobbypeople.net.
**Horizon Hobby Inc.** (800) 338-4639; horizonhobby.com.
**Hydrimax by Hobbico;** dist. by Great Planes.
**ICARE Sailplanes** (450) 449-9094; icare-rc.com.
**Ikarus USA** (239) 690-0003; ikarus.net.
**Innovative Home Products** (866) 607-8736; innovativehomeproducts.com.
**Internet-RC** (602) 347-1600; Internet-RC.com.
**Iron Bay Model Co.** (304) 232-7511; ironbaymodelcompany.com.
**J&Z Products** (310) 539-2313.
**Jet Hangar Hobbies** (562) 467-0260.
**Jeti;** dist. by Hobby Lobby Intl.
**JMP;** dist. by Bob Selman Designs.
**JR;** dist. by Horizon Hobby Inc.
**K&S Engineering** (773) 586-8503; ksmetals.com.
**Kangke USA** (877) 203-2377; kangkeusa.com.
**Kondor Model Products** (888) 968-7251; kmp.ca.
**Kress Technologies Inc.** (845) 336-8149; kressjets.com.
**Kyosho;** dist. by Great Planes; kyosho.com.
**Landing Products** (916) 661-0399.
**Lanier RC** (770) 532-6401; lanierrc.com.
**Liteflyers RC;** Liteflyrc.com.
**Loctite** (216) 475-3600; loctiteproducts.com.
**Mabuchi** (248) 816-3100; Mabuchi-motor.co.jp.
**Macs Products** (916) 456-6932; macspro.com.
**Magnum;** dist. by Global Hobby.
**Maiden Model Products** (612) 730-7151.
**Master Airscrew;** dist. by Windsor Propeller Co.
**Maxon Precision Motors Inc.** (800) 865-7540; maxonmotorsusa.com.
**Maxx Products Intl.** (800) 416-6299; maxxprod.com.
**Micro Fasteners** (908) 806-4050.
**Miller R/C Products** (707) 833-5905.
**Model Machining Service** (949) 631-2982; innerdemon.com.
**Model Tech;** dist. by Hobby People.
**MonoKote;** dist. by Great Planes.
**Morgan Fuel** (800) 633-7556; morganfuel.com.
**Morris Hobbies** (800) 826-6054; morrishobbies.com.
**Mosquitobite Plans** (613) 256-0008; mosquitobiteplans.com.
**MP Jet;** dist. by Hobby Lobby; mpjet.com.
**MRC** (732) 225-2100; modelrec.com.
**MS Composit USA** (510) 226-1165; mscomposit-usa.com.
**Multiplex;** dist. by Hitec RCD.
**Nick Ziroli Plans** (941) 924-3868; ziroliplans.com.
**Northeast Sailplane Products** (802) 655-7700; nesail.com.
**Northeast Screen Graphics** (800) 557-5617; majordecals.com.
**O.S. Engines;** dist. by Great Planes; osengines.com.
**Palmer Plans** (818) 348-0879.
**Parkflyers R/C** (732) 363-6181; parkflyers.com.
**Paul K. Guillow Inc.** (781) 245-5255; guillow.com.
**Peck-Polymers** (619) 448-1818; peck-polymers.com.
**Performance Devices Inc.;** performancedevices.com.
**Performance R/C** (504) 832-2028.
**Planes Plus** (630) 904-9983; planesplus.com.
**Plantraco** (306) 955-1836; plantraco.com.
**Plastruct Inc.** (626) 912-7016, plastruct.com.
**Polk's Hobby;** polkshobby.com.
**PowerMaster Hobby Products Inc.** (512) 285-9595; powermasterfuels.com.
**Propwash Video** (800) 355-7333; propwashvideo.com.
**Quantum Models** (877) 738-9270; quantummodels.com.
**Quique's Aircraft Co.;** somenzini.com.
**R/C Direct** (858) 277-4531; rc-direct.com.
**RC Electronics** (408) 705-1980; rc-car-planes.com.
**R/C Showcase** (301) 374-2197; rcshowcase.com.
**RAm Radio Controlled Services** (847) 740-8726; ramrcandramtrack.com.
**RC Superstore;** rcsuperstore.com.
**RCAT Systems** (408) 292-9794; rcatsystems.com.
**RCV Engines Ltd.;** dist. by Wildcat Fuels.
**ReadyToFlyFun.com** (866) 472-8697.
**Richmond RC Supply** (877) 727-2329; richmondrc.com.
**Robart Mfg.** (630) 584-7616; robart.com.
**RTL Fasteners** (800) 239-6010; rtlfasteners.com.
**Saito Engines;** dist. by Horizon Hobby.
**Scorpio;** dist. by Hobby Lobby Intl.
**Seagull Models;** dist. by Horizon Hobby.
**Sherline Products Inc.** (800) 541-0735; sherline.com.
**Sig Mfg. Co. Inc.** (800) 247-5008; sigmfg.com.
**SK Engines;** dist. by Kangke USA.
**SKS Video Productions** (800) 988-6488; sksvideo.com.
**Sky Hooks & Rigging** (905) 257-2101; microrc.com.
**Skyshark RC** (866) 854-6100; skysharkrc.com.
**Smithy** (800) 476-4849; smithy.com.
**SoarSoft Software** (810) 225-1165.
**Solarbotics;** solarbotics.com.
**Sombra Labs Inc.** (613) 863-4901.
**Sonic-Tronics** (215) 635-6520; sonictronic.com.
**Sportsman Aviation;** dist. by Global Hobby.
**SR Batteries Inc.** (631) 286-0079; srbatteries.com.
**Sullivan Products** (410) 732-3500; sullivanproducts.com.
**Super Kraft;** dist. by Kangke USA.
**T&D Plan Sales;** classicairplanemodels.com.
**Tejera Microsystems Engrg.** (TME) (813) 661-2649; tmenet.com.
**Tekoa: The Center of Design** (909) 763-0464.
**The Ornithopter Zone** (800) 445-4215; ornithopter.org.
**Thunder Power Batteries;** dist. by Hobby Lobby and Northeast Sailplane Products; (702) 228-8883; thunderpower-batteries.com.
**Thunder Tiger;** dist. by Ace Hobby.
**Tiger Shark;** dist. by Kangke USA.
**Top Flite;** dist. by Great Planes; top-flite.com.
**Tower Hobbies** (800) 637-4989; towerhobbies.com.
**Trick R/C** (310) 301-1614; Zagi.com.
**Tru-Turn Precision Model Products;** dist. by Romco Mfg.; tru-turn.com.
**U.S. Engines Products;** dist. by Great Planes.
**UltraCote;** dist. by Horizon Hobby.
**Ultrafly;** dist. by Great Planes.
**Uttam;** uttam.freeservers.com.
**Vanguard Vancouver;** pacifier.com/~vvancou.
**VMAR;** dist. by Richmond RC.
**Walbro** (520) 877-3000; walbro.com.
**WeMoTec;** wemotec.com.
**WES-Technik;** wes-technik.de.
**West Mountain Radio** (203) 853-8080; westmountainradio.com.
**Weston USA** (508) 520-1170; westonusa.com.
**Wide Canyon Engines** (253) 653-9481; widecanyonengines.com.
**Wildcat Fuels** (859) 885-5619; wildcatfuel.com.
**Wild Hare R/C** (817) 430-0107; wildharerc.com.
**Windsor Propeller Co.** (916) 631-8385.
**WRAM;** wram.org.
**X-Treme Composite;** dist. by Planes Plus.
**YS;** dist. by Futaba Corp. of America.
**Zap** (800) 538-3091; zapglue.com.
**Zinger;** dist. by J&Z Products; zingerpropeller.com.
**Zurich Intl.** (800) 533-5665.

MODEL Airplane NEWS

# Customer Service

For fast service, go to:
www.modelairplanenews.com
and select "Customer Service"

All of the following services are available online!

- Subscribe
- Change your address
- Report missing or damaged issues
- Make payments
- Check your account status
- Renew your subscription

## How to read your label:


Your account number is
12345ABC123AB12C.
Your expiration date issue is August 2005.

## Address changes

Please allow 4-6 weeks for address changes to be processed. To change your address by mail, send a copy of your current label and your new address information to:

Model Airplane News
P.O. Box 420235
Palm Coast, FL 32142-0235 USA

You can also contact us at: modelairplanenews@palmcoastd.com, phone (386) 246-3323, or fax (386) 447-2321. For faster service, go online.

## Our cancellation policy

All cancellations must be requested in writing. You may send your request via mail, email, or fax.

## Our renewal policy

We will send you a renewal notice 3 months prior to your subscription's expiration date. For faster service, renew online at **www.modelairplanenews.com**

## Advertisers



This advertiser index is provided as a service to our readers. Air Age is not responsible for errors in or omissions of names or page numbers.


**MODEL AIRPLANE NEWS** (USPS 533-470; ISSN 0026-7295) is published monthly by Air Age Inc., 100 East Ridge, Ridgefield, CT 06877-4606 USA.



Periodicals postage permit paid at Ridgefield, CT and additional offices. Canadian Post Publications Mail Agreement No. 40008153.

**SUBSCRIPTIONS AND BACK ISSUES:** in U.S., call (800) 827-0323; Canada and elsewhere, call (386) 246-3323; fax (386) 447-2321; or go to www.modelairplanenews.com. U.S., $29.95 (1 yr.); Canada, $39.95, including GST (1 yr.); International $54.95 (1 yr.). All international orders must be prepaid in U.S. Funds; Visa, MC, Discover and AmEx accepted.

**EDITORIAL:** send correspondence to Editors, *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. Email: man@airage.com. We welcome all editorial submissions, but assume no responsibility for the loss or damage of unsolicited material. To authors, photographers and people featured in this magazine: all materials published in *Model Airplane News* become the exclusive property of Air Age Publishing Inc. unless prior arrangement is made in writing with the Publisher.

**ADVERTISING:** send advertising materials to Advertising Dept., *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA; (203) 431-9000; fax (203) 431-3000; sales@airage.com.

**CHANGE OF ADDRESS:** to ensure that you don't miss any issues, send your new address to *Model Airplane News*, P.O. Box 420235, Palm Coast, FL 32142-0235 USA six weeks before you move. Please include the address label from a recent issue, or print the information exactly as shown on the label. For faster service, go to www.modelairplanenews.com and click on the customer service link.

**POSTMASTER:** send Form 3579 to *Model Airplane News*, P.O. Box 420235, Palm Coast, FL 32142-0235 USA.

# Lightning Strikes!

## THE FORKTAILED DEVIL SQUADRON INVADES NORTHERN CALIFORNIA

Left to right: Robert Delozier, Kim Lines, Scott Rowan, Monty Welch and Jim Adams make up the Section 8 Air Force. Not shown: Glenn Hoffman and Jim Williams.

**SEVERAL PILOTS IN MY CLUB FLY MOSTLY** WW II aircraft, and we've found that flying similar aircraft together in formation is a lot of fun and adds a new dimension to our time at the field. To capitalize on this idea and give it direction and organization, we formed the "Section 8 Air Force." We thought this was an apt name, since you have to be a little crazy to risk the investment of time, effort and money to be in the air along with seven or eight other airplanes that are trying to perform some semblance of a formation!

We chose to make our first squadron out of P-38s because that plane is a complex, twin-engine aircraft that demands superior pilot skills and building abilities. With models from G&P Sales, Kondor Model Products and VQ Models, we named ourselves the "Forktailed Devils" after the German nickname for that plane. The members of our squadron wear appropriate Forktailed Devil T-shirts and P-38 hats. We've even gotten our families involved; Melissa Hoffman, the wife of one of our pilots, designed the devil logo that adorns each P-38 and made our squadron banner, and my wife, Linda Welch, helped design the nose art that appears on some of the aircraft.

In 2004, the Forktailed Devils made their first group appearance at the IMAA Giant Scale Fly-In at Merced, CA. Of the seven P-38s at the event, six of them took off, flew in a loose formation and landed safely (the seventh one blew a glow plug just before takeoff). Pilots and spectators felt that they had just witnessed a first in model aviation! We also performed at the annual Wings of Victory WW II model airshow in Woodland, CA. This time, seven P-38s took to the sky, and some were equipped with bomb drops that worked admirably. One WW II P-38 pilot in the crowd became very emotional about what he had just witnessed and said we had brought back many memories of his flying experiences. He hopes to bring his P-38 pilot group from Sacramento to the 2005 Wings of Victory airshow in July, where we plan to make another appearance. You can also see us at other Northern California events, including the IMAA show at Castle Park in Merced.

What's next for the Section 8 Air Force? We recently formed a Night Fighter Squadron of P-61 Black Widows, and a B-25 Doolittle Raiders Squadron isn't far behind!